

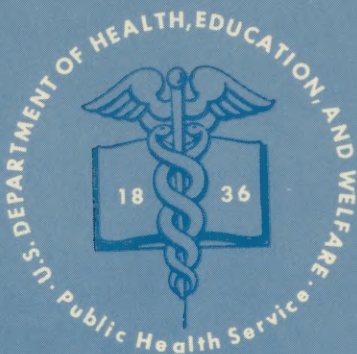
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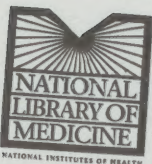


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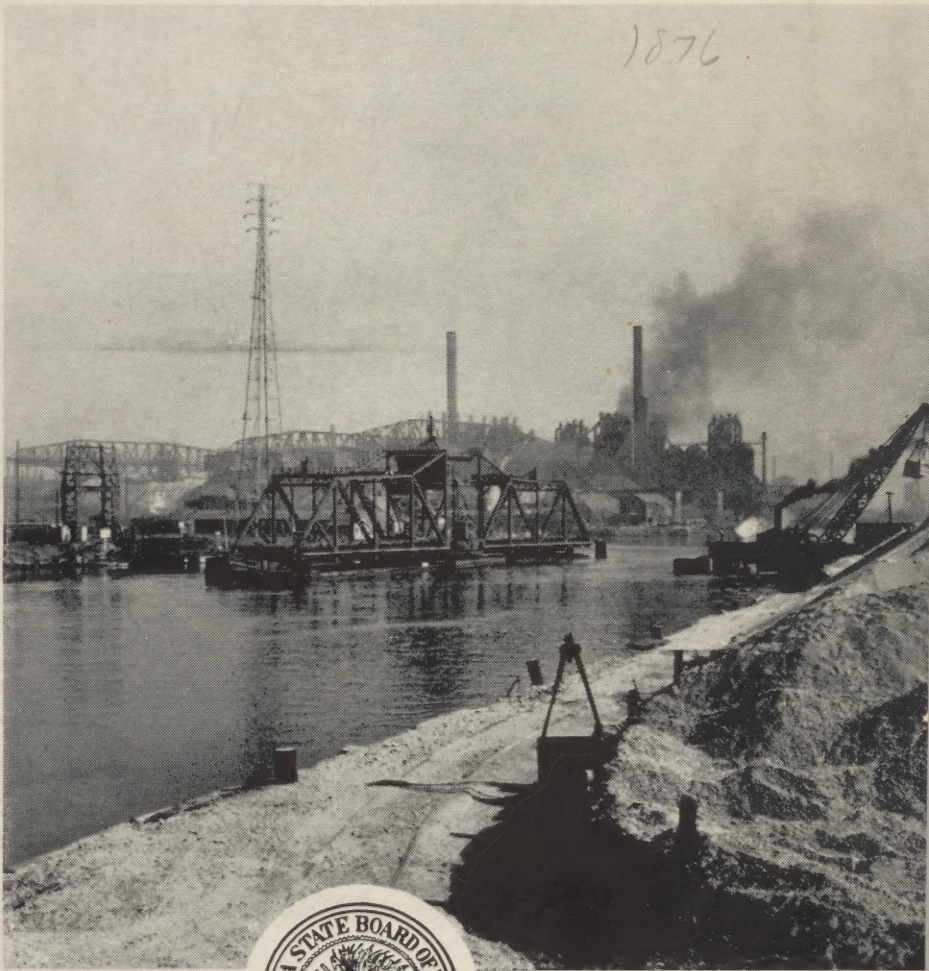
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PRELIMINARY INDUSTRIAL HYGIENE SURVEY OF INDIANA INDUSTRIES

INDIANA STATE BOARD OF HEALTH
BUREAU OF INDUSTRIAL HYGIENE



INDIANA STATE BOARD OF HEALTH

VERNE K. HARVEY, M.D., C.P.H., Director

Indiana. Bureau of Industrial Hygiene

PRELIMINARY INDUSTRIAL HYGIENE SURVEY
OF INDIANA INDUSTRIES

BY

THE BUREAU OF INDUSTRIAL HYGIENE

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INDIANA STATE BOARD OF HEALTH

INDIANAPOLIS, INDIANA

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INTRODUCTION

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INTRODUCTION

Through joint activities of Governor Townsend, the United States Public Health Service, the Indiana State Labor Department and the Indiana State Board of Health, a Bureau of Industrial Hygiene was created February 15, 1938. Skeletal personnel was secured and, under the guidance of the Division of Industrial Hygiene of the United States Public Health Service, this personnel was taken through its neonatal existence in Industrial Hygiene.

Since industrial hygiene activities were new for Indiana, very little basic information was available as to number of plants, number of workers, types of industries, potential hazards in industry, or occupations in which these hazards were prone to occur. Welfare data as to safety, medical facilities and morbidity records were also scarce.

It was believed that to formulate a substantial and well founded program for this Bureau to follow in coping with industrial hygiene problems, the above data should be known so that logical conclusions may be reached as to the probable magnitude of our problem. With this in view, a state wide industrial hygiene survey was made.

That there is a problem associated with occupational disease control may be exemplified by a statement of Dr. Sayers,¹ Chief of Division of Industrial Hygiene, United States Public Health Service, in which he reveals that the industrial worker has a higher incidence of tuberculosis, pneumonia and degenerative diseases in addition to the potential occupational diseases associated with his occupation. Further, it is being shown that the average life expectancy of an industrial worker is seven years less than that of the non-industrial worker.²

Most occupational diseases are preventable through proper engineering controls and on that belief, the Bureau of Industrial Hygiene undertook the study of the problem of occupational diseases in Indiana; their potential occurrences and their control.

This report summarizes the study of the problems dealing with:

- a. Statistical analysis of workers by sex, occupation and industry.
- b. Statistical analysis of plants as to number, size and types.
- c. Welfare facilities for workers.
- d. Potential hazardous material exposures.
- e. Occupations where these potential hazards may tend to occur.
- f. Control of the exposures.

This study was a preliminary one and at no time was the exposure evaluated by quantitative laboratory determinations. Only logical potentialities were noted.

These results will serve as a basis for the constructive development of the following industrial hygiene services in Indiana:

I. General:

- Plant surveys to determine potential health hazards.
- Detailed plant studies to determine extent of hazards.
- Investigate complaints.
- Answer inquiries regarding occupational hygiene.
- Cooperate with other departments and agencies.
- Educational.

Long Term Program—

- Secure reporting of occupational diseases by legislative enactment.
- Stimulate plants to keep records of all absenteeism.
- Train local district personnel to handle their own local industrial hygiene problems.

II. Medical:

- Consultation in diagnosis and treatment of occupational diseases.
- Advice as to proper control measures.
- Physical and X-ray examinations in special studies as requested.

III. Engineering:

- Dust determinations.
- Advice as to removal of dusts, fumes and gases from plants by means of proper ventilation.
- Illumination.
- Sanitation.

IV. Chemical:

- Analysis of materials used in plants.
- Collection and analysis of air samples from workrooms.
- Determination of atmospheric concentration of gases, fumes, and vapors.

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SUMMARY

1. Recommendations

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SUMMARY

1. 2,545 establishments employing 247,817 people were studied. The establishments drawn for a sample survey, were in the classifications of: Extraction of Minerals, Mechanical and Manufacturing, and Domestic and Personal Service of which only laundries and dry cleaning plants were included.
2. The 1939 United States census lists 404,059 people engaged in the industries of the type studied. The survey accounted for 61.3% of the 1930 census figure.
3. Indiana is the ninth largest industrial State in the Union.
4. Through the cooperation of the various agencies, a complete industrial file was established in the Bureau. The census of our file (1938-1939) shows 328,432 people engaged in the type industries studies. The survey sample accounted for 75.5% of this figure. Based on the 1930 census or our present file, the sample appeared adequate and data presented may be assumed to be representative of the conditions found.
5. 78.5% of plants studied employed less than 100 workers while 96.8% of plants employed less than 500 workers. The bulk of Indiana's industry is in small plants.
6. 23% of the industrial population studied was employed in plants listed as 1-100 size and 62.9% were employed in plants listed as 1-500 size. Better than half of Indiana's industrial population is included in the 96.8% of plants employing less than 500 people. Conclusions reached by Newquist^a in a study by the American College of Surgeons indicate that plants employing less than 500 people cannot economically render health services needed.
7. Study of health services available revealed that:
 - 24.9% of workers had services of a full time safety director.
 - 21.0% of workers had services of a part time director.
 - 46.3% of workers had services of a shop committee.
 - 4.1% of workers had facilities of a company owned hospital.
 - 9.0% of workers had facilities of a contract hospital.
 - 55.0% of workers had facilities of a first aid room.
 - 88.0% of workers had the use of a first aid kit.
 - 49.8% of workers had services of trained first aid workers.
 - 10.0% of workers had services of full time plant physician.
 - 18.5% of workers had services of part time plant physician.
 - 35.5% of workers had services of full time plant nurse.
 - 50.3% of workers were members of Sick Benefit Associations.
 - 56.7% of workers had sickness records kept for them.
 - 98.3% of workers had accident records kept for them.
8. In general persons employed in plants larger than 100 had more welfare facilities than those employed in plants less than 100. (See Table 8.)
9. Welfare facilities although inadequate compared favorably with other states. (See Table 9.)

10. A majority of the sanitation fixtures were found to be of a type which is not approved by the Indiana State Board of Health. Approved fixtures found were: Fountains 20.2%, Lavatories 62.5%, Flush toilets 15.8%, Pit privies 38.6% and Urinals 47.3%.
11. Ratio of workers per facility was near recommended ratio. (See Table 10.)
12. 15.3% of workers had use of an individual drinking cup.
15.9% of workers had use of a common cup.
44.8% of workers had use of a common towel.
62.7% of workers had use of individual towel.
47.5% of workers were provided with individual lockers.
13. In descending order of number of workers exposed; exposures to metals (36,549 workers), dermatitis producers (27,599 workers), organic dusts (22,948 workers), high humidity (15,673 workers), extreme temperature changes (12,921 workers), silica dusts (11,842 workers), silicate dusts (11,312 workers), gases (11,312 workers), petroleum products (10,067 workers), non-siliceous dusts (9,647 workers) and lead (6,884 workers) were noted as the most common for Indiana industries. (For complete list and relative frequencies, see Table 13.)
14. The most probable potential exposures were noted for each industrial group as well as the occupations in which they tend to occur, so that control measures may be instituted at potential foci.
15. In general control measures provided were limited in number.
16. Indiana is a large industrial state; the bulk of its industry is housed in small plants; the workers are potentially exposed to numerous hazardous materials and it becomes obvious that the small plant is not able financially to engage services of engineers, chemists and physicians to cope with their problems. Thus some unbiased governmental agency such as the State Board of Health should be charged with the responsibility of giving this service to industry.

RECOMMENDATIONS

1. That detailed field and laboratory studies be undertaken in solving the problems of dermatitis producers, silica and lead dusts.
2. That the State Board of Health, through its Bureau of Industrial Hygiene, offer laboratory, medical and engineering services to industry.
3. That all records and findings of the Bureau of Industrial Hygiene should be immune from court testimony in civil action, so that industry, labor, medicine, and other interested agencies may feel free to use the services of this Bureau. The Bureau at all times should be a neutral fact-finding agency.
4. That reporting of occupational diseases by physicians and all absenteeism due to illness by industry be inaugurated. In this way the Bureau, through analysis of records may spot endemic foci of occupational diseases before they reached major proportions.
5. That medical welfare activities be increased with special emphasis on industrial nursing. Small plants should have some competent individual present at all times, and a nurse, trained in industrial hygiene, would help solve that problem.
6. That this Bureau cooperate closely with the State Labor Department by offering medical and engineering consultations, as well as industrial laboratory facilities.
7. That this Bureau establish itself as a service Bureau to industry and interested agencies.
8. That a general educational program be undertaken by the Bureau offering speakers, literature, and motion pictures to interested groups. Further that the full time district personnel become thoroughly acquainted with the problems and that eventually these districts may participate in the solution of these problems locally.
9. That a complete industrial library be maintained by the Bureau for use by all agencies.
10. That an industrial sanitation program be inaugurated by the State Board of Health.
11. That due credit be given the United States Public Health Service, Division of Industrial Hygiene, for instituting this service in Indiana and for the splendid cooperation offered by the Service since then.

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SCOPE AND PLAN OF SURVEY

1. Details Survey
 2. Types Industries Surveyed
 3. Distribution by Counties
-

Scope and Plan of Survey

It was thought desirable to limit the survey to types of industries in which occupational diseases were prone to occur. Therefore agriculture, forestry and fishing, transportation and communication, trade, postal service, building, independent hand trades, domestic and personal services (except laundries and dry cleaning) and professional services were not included.

All plants of the types of industries or service groups to be surveyed employing four or more people were included. A complete card file was made of these plants and arranged according to a coded industrial classification furnished by the Division of Industrial Hygiene of the United States Public Health Service.

While it is agreed that a complete survey of all industries would be valuable, it was further agreed that a sample survey would suffice. A 66 2/3% sample was selected by drawing two cards and leaving one, thereby achieving an unbiased sample. These cards were rearranged geographically by counties and Field Engineers assigned to the plants. Prior to engaging in the field activities, the field personnel was given a course of instructions and orientation by Sanitary Engineer J. J. Bloomfield, of the United States Public Health Service. The survey time was limited to six months of field work.

Approximately ten days prior to the Engineers' visit to a plant, an informative letter, signed by Dr. Harvey, Secretary of the State Board of Health, was sent to the plant from the central office, informing the plant management of the purpose of the study and enlisting his cooperation. The study was a voluntary function of industry.

Forms used in the field were two in number designated as three and four. (See Appendix B.) Form three was designed to record health service data for the plant as a whole. Form four was designed to record occupations, nature of the job, raw materials and by-products handled and what control measures were used. These forms were sent to the central office where they were checked, classified, edited (noting potential exposures associated with each occupation) and tabulated on special forms. (See Forms five, six, seven, eight and nine in Appendix B.)

FIGURE 1

Organization of Indiana Industrial Hygiene Survey

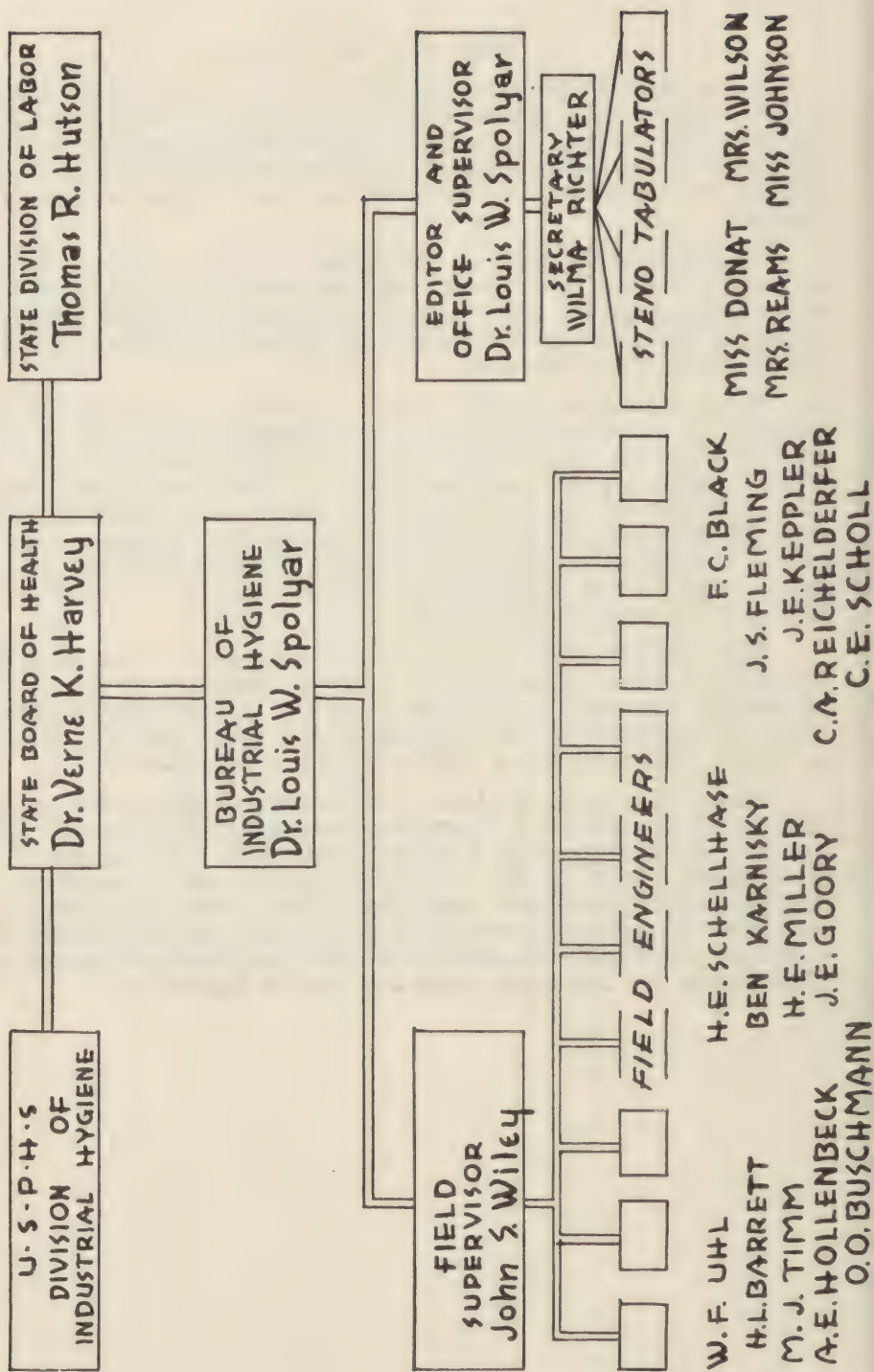
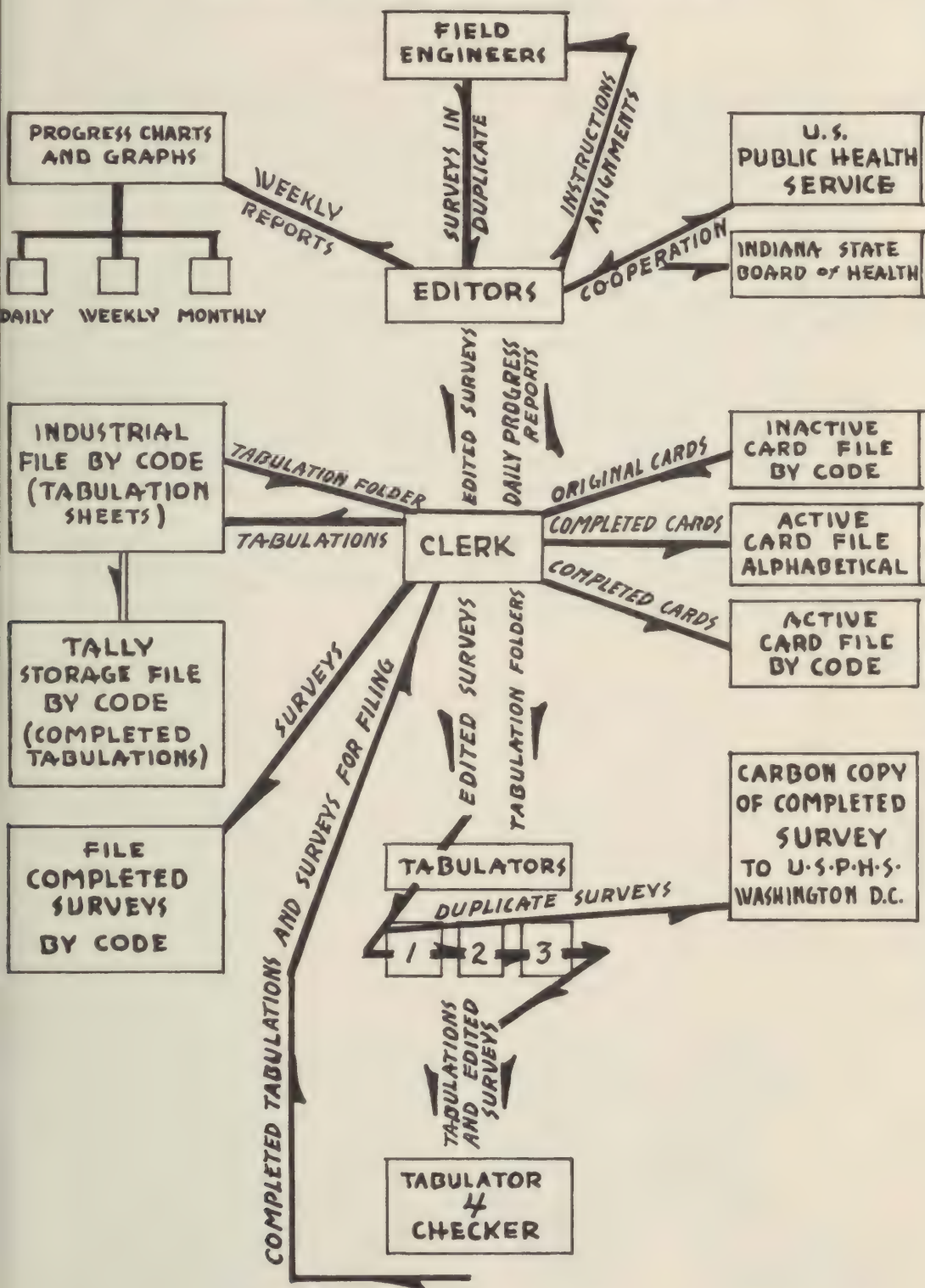


FIGURE 2

Flow Sheet for Industrial Hygiene Survey

INDIANA STATE BOARD OF HEALTH



DETAILS OF THE STUDY

Type of Industries Surveyed

Table 1 summarizes the number of establishments surveyed in each industrial classification, the sex distribution in each classification and the total number of employees under observation. The study included 2,545 plants with a population of 247,817. The largest number of plants surveyed was in the manufacturing and mechanical group, 2,309 plants employing 238,183 persons. In the extraction of minerals 74 plants employing 4,704 persons were included. Of this group 47 were coal mines accounting for 4,125 employees. The sand, gravel and limestone quarries contributed scantily to this classification because the survey was "off season" for their peak activity. In the domestic and personal services group 162 establishments, accounting for 4,930 persons were surveyed. See pictorial map for geographical distribution of products.

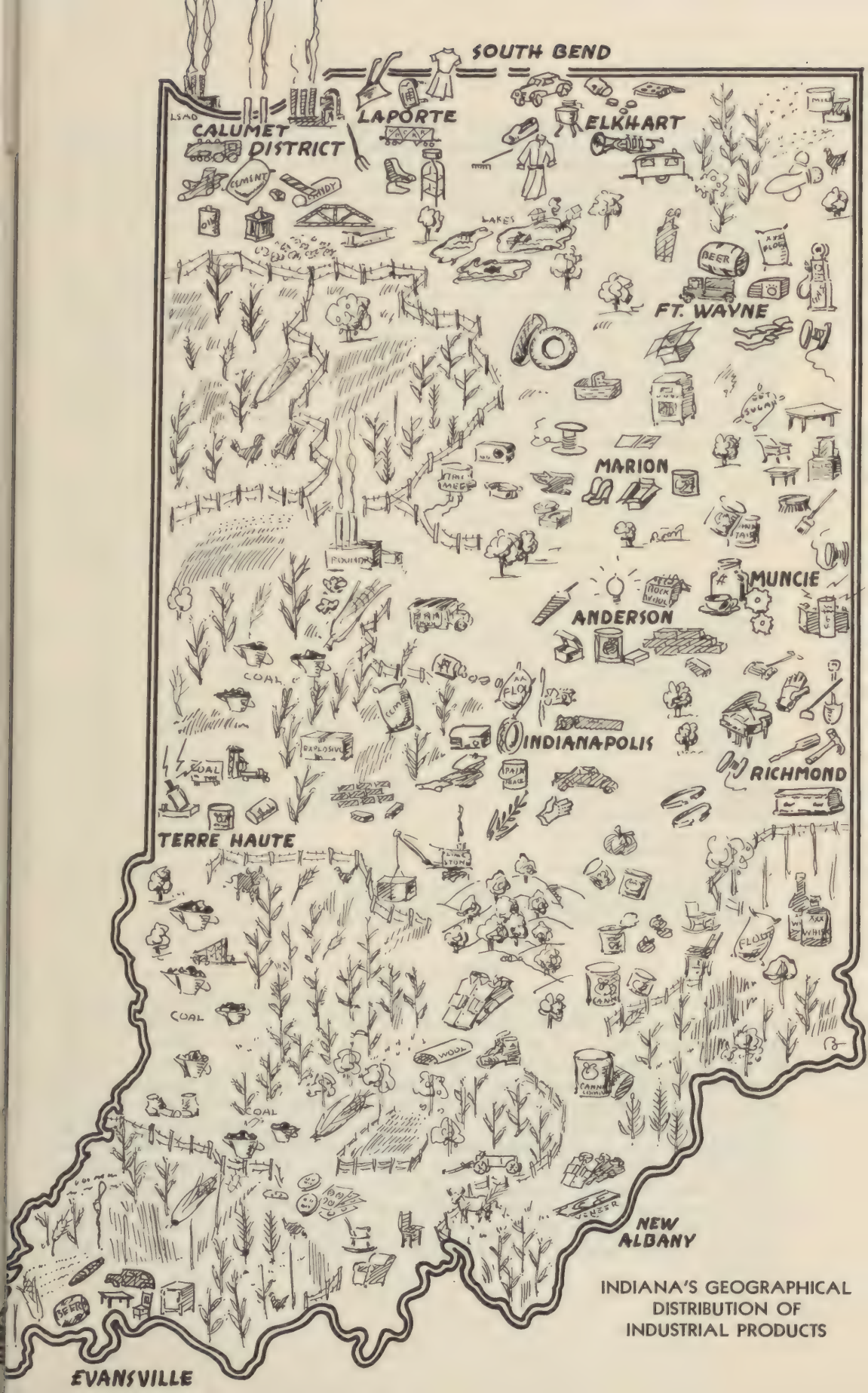
In the manufacturing and mechanical group, the largest number of plants surveyed in any one sub-group was in the Food and Allied Industries, in which 535 plants employing 35,464 workers were covered. This was due to the fact that 107 fruit and vegetable canning establishments were covered during the peak of their seasonal run. The Iron and Steel Industry had the greatest number of workers of any sub-group, 80,728 employees working in 480 plants having been surveyed.

An attempt was made to survey all types of industries, except those purposely omitted, in order to obtain a true cross-section of the environmental conditions surrounding workers in the State, as well as to determine potential occupational disease hazards.

TABLE 1.—NUMBER OF PLANTS AND EMPLOYERS IN INDIANA INDUSTRIES AND SERVICE

GROUPS SURVEYED

| INDUSTRY OR SERVICE GROUP | Number of Plants | NUMBER OF WORKERS | | |
|--|------------------------|-------------------|---------|---------|
| | | Total | Males | Females |
| TOTAL ALL PLANTS SURVEYED..... | 2,545 | 247,817 | 186,531 | 61,286 |
| EXTRACTION OF MINERALS..... | | | | |
| Coal mines..... | 74 | 4,704 | 4,089 | 15 |
| Sand and gravel..... | 47 | 4,125 | 4,118 | 7 |
| Limestone quarries..... | 24 | 371 | 365 | 6 |
| | 3 | 208 | 206 | 2 |
| MANUFACTURING AND MECHANICAL..... | 2,309 | 238,183 | 179,997 | 58,186 |
| Chemical and Allied..... | | | | |
| Explosives, ammunition and fireworks..... | 107 | 15,741 | 13,584 | 2,177 |
| Fertilizer..... | 3 | 84 | 80 | 4 |
| Fuel gas manufacture..... | 9 | 267 | 260 | 7 |
| Paint and varnish..... | 4 | 168 | 166 | 0 |
| Petroleum refineries..... | 17 | 678 | 576 | 102 |
| Soap..... | 6 | 7,659 | 7,449 | 210 |
| Slaking..... | 4 | 1,584 | 1,369 | 214 |
| Blacking, stains..... | 3 | 351 | 1,192 | 132 |
| Chemical works..... | 7 | 1,156 | 1,146 | 11 |
| Compressed gases..... | 7 | 1,160 | 1,140 | 11 |
| Drugs, patent medicines..... | 20 | 2,527 | 1,285 | 1,242 |
| Glues, paste..... | 3 | 133 | 123 | 10 |
| Greases, tallow..... | 3 | 48 | 31 | 15 |
| Oils (not petroleum)..... | 2 | 77 | 32 | 45 |
| Perfumes, cosmetics..... | 4 | 816 | 740 | 76 |
| Other chemicals and allied..... | 12 | | | |
| Cigar and tobacco..... | 10 | 1,035 | 159 | 876 |
| Clay, glass and stone..... | | | | |
| Clay, brick, tile, terra cotta..... | 169 | 15,343 | 13,158 | 2,185 |
| Mirrors..... | 31 | 2,660 | 1,892 | 768 |
| Glass..... | 7 | 1,157 | 1,211 | 56 |
| Cement..... | 10 | 6,507 | 4,949 | 1,558 |
| Lime and artificial stone..... | 24 | 1,500 | 1,560 | 40 |
| Marble and stone yards..... | 46 | 2,293 | 2,256 | 37 |
| Pottery..... | 7 | 152 | 112 | 40 |
| Roofing, asphalt..... | 7 | 715 | 615 | 102 |
| Asbestos products..... | 4 | 175 | 176 | 3 |
| Rock wool, other clay, glass and stone..... | 5 | 615 | 558 | 77 |
| | 14 | 1,175 | 1,041 | 134 |
| Clothing..... | | | | |
| Gloves..... | 100 | 17,456 | 2,780 | 14,676 |
| Shirt, collar and cuff..... | 18 | 1,330 | 372 | 1,567 |
| Suit, coat and overall..... | 6 | 7,360 | 1,886 | 1,144 |
| Women's clothing..... | 36 | 7,383 | 1,323 | 6,260 |
| Other clothing..... | 20 | 3,108 | 315 | 2,790 |
| | 20 | 3,496 | 581 | 2,915 |
| Food and allied..... | | | | |
| Bakeries..... | 535 | 35,464 | 22,600 | 12,864 |
| Dairy products..... | 80 | 3,568 | 2,995 | 563 |
| Candy..... | 120 | 3,392 | 2,751 | 641 |
| Fruit and grain mills..... | 11 | 1,867 | 1,594 | 263 |
| Fruit and vegetable canning..... | 58 | 1,555 | 1,357 | 198 |
| Slaughter and packing houses..... | 107 | 15,378 | 5,777 | 9,461 |
| Ice manufacturing..... | 39 | 3,231 | 2,326 | 385 |
| Spices, coffee..... | 39 | 868 | 517 | 351 |
| Other foods..... | 18 | 349 | 248 | 101 |
| Non-alcoholic beverages..... | 35 | 2,515 | 1,892 | 683 |
| Alcoholic beverages..... | 18 | 3,455 | 3,185 | 287 |
| Iron and steel industry..... | | | | |
| Agricultural implements..... | 480 | 80,738 | 75,184 | 5,544 |
| Automobiles, parts and trailers..... | 11 | 2,930 | 2,714 | 216 |
| Wagon mills..... | 64 | 2,118 | 18,524 | 1,584 |
| Plast furnaces, steel rolling mills..... | 12 | 9,185 | 1,975 | 160 |
| Car and railroad shops..... | 15 | 17,340 | 16,867 | 433 |
| Ship and boat building..... | 13 | 2,916 | 2,867 | 49 |
| Wagon and carriage..... | 4 | 232 | 204 | 28 |
| Aircraft..... | 3 | 343 | 338 | 5 |
| Foundries..... | 86 | 11,362 | 11,080 | 282 |
| Machine shops..... | 56 | 1,691 | 1,611 | 80 |
| Small machinery, implements, cutlery..... | 88 | 3,316 | 3,224 | 92 |
| Heavy machinery..... | 44 | 3,446 | 3,494 | 404 |
| Other iron and steel..... | 105 | 13,681 | 11,866 | 1,575 |
| Metal industries, except iron and steel..... | | | | |
| Press mills, musical instruments..... | 143 | 9,474 | 8,010 | 1,464 |
| Copper..... | 26 | 2,161 | 1,814 | 347 |
| Jewelry..... | 7 | 1,789 | 1,577 | 222 |
| Lead and zinc..... | 8 | 369 | 268 | 101 |
| Hardware, enamelware..... | 50 | 757 | 713 | 44 |
| Aluminum..... | 8 | 2,276 | 2,004 | 272 |
| Metal specialties, novelties..... | 6 | 336 | 287 | 49 |
| Other metal industries..... | 12 | 289 | 125 | 114 |
| Electro-plating, metal finishing..... | 21 | 1,137 | 872 | 285 |
| | 21 | 380 | 350 | 30 |
| Leather..... | | | | |
| Shoes..... | 21 | 2,056 | 1,268 | 788 |
| Tanneries..... | 6 | 1,616 | 891 | 725 |
| Trunk, suitcase, bag..... | 4 | 296 | 290 | 6 |
| Other leather industries..... | 7 | 85 | 56 | 23 |
| | 7 | 85 | 51 | 34 |
| Lumber and furniture..... | | | | |
| Furniture factories..... | 287 | 18,757 | 16,896 | 1,861 |
| Caskets..... | 133 | 12,953 | 11,920 | 1,033 |
| Piano and organ..... | 5 | 802 | 581 | 221 |
| Saw and planing mills..... | 53 | 1,021 | 312 | 29 |
| Other woodworking..... | 73 | 3,640 | 3,112 | 528 |
| Paper, printing and allied..... | | | | |
| Wallpaper and wall paper..... | 272 | 12,075 | 8,476 | 3,599 |
| Paper and pulp mills..... | 4 | 140 | 106 | 34 |
| Paper boxes..... | 8 | 332 | 332 | 100 |
| Other paper products..... | 28 | 2,432 | 1,701 | 831 |
| Book binding..... | 9 | 2,253 | 1,157 | 1,066 |
| Lithographing and developing..... | 19 | 316 | 434 | 216 |
| Linographing..... | 7 | 251 | 222 | 59 |
| Newspaper printing..... | 76 | 3,472 | 2,861 | 611 |
| Stereotyping..... | 6 | 79 | 66 | 13 |
| Other printing and allied industries..... | 86 | 2,020 | 1,420 | 600 |
| Textile..... | | | | |
| Knitting mills..... | 51 | 8,232 | 3,387 | 4,845 |
| Textile dyeing, finishing and printing..... | 6 | 5,003 | 2,603 | 2,398 |
| Woolen and worsted mills..... | 2 | 608 | 317 | 308 |
| Hemp, jute and linen mills..... | 2 | 24 | 14 | 10 |
| Tent and awning..... | 15 | 230 | 142 | 81 |
| Other textile mills..... | 22 | 770 | 335 | 435 |
| Miscellaneous manufacturing..... | | | | |
| Broom and brush..... | 134 | 21,827 | 14,515 | 7,307 |
| Buttons..... | 10 | 342 | 124 | 218 |
| Batteries..... | 2 | 105 | 55 | 50 |
| Lamp fixtures..... | 3 | 850 | 795 | 55 |
| Other electric machinery and supply..... | 3 | 1,990 | 1,524 | 466 |
| Rubber..... | 42 | 7,617 | 4,730 | 2,887 |
| Straw and strawboard..... | 21 | 8,801 | 5,654 | 3,147 |
| Dental appliances and supplies..... | 4 | 499 | 494 | 5 |
| Signs (non-electric)..... | 43 | 41 | 41 | 2 |
| Toys and novelties, fishing tackle..... | 9 | 160 | 127 | 33 |
| Hair goods, artificial flowers..... | 3 | 621 | 347 | 274 |
| Lenses..... | 10 | 233 | 134 | 119 |
| Lamp and window shades..... | 2 | 233 | 185 | 48 |
| Miscellaneous manufacturing..... | 18 | 280 | 24 | 73 |
| PERSONAL SERVICE..... | | | | |
| Laundries..... | 162 | 4,930 | 1,845 | 3,085 |
| Dry cleaning..... | 101 | 3,781 | 1,187 | 2,594 |
| | 61 | 1,149 | 658 | 491 |



SOUTH BEND

CALUMET DISTRICT

LAPORTE

ELKHART

FT. WAYNE

MARION

MUNCIE

ANDERSON

INDIANAPOLIS

RICHMOND

TERRE HAUTE

NEW ALBANY

EVANSVILLE

INDIANA'S GEOGRAPHICAL
DISTRIBUTION OF
INDUSTRIAL PRODUCTS

Table 2 summarizes data of Table 1 and compares this survey summary with the 1930 United States census figures for the types of industries studied. In addition, for completion, the data are compared against our completed industrial file census. Thus we surveyed 61.3% of the 1930 United States census population and 75.5% of our industrial file population. This discrepancy may be explained by the general decrease of employment during this decade.

The figures given for food and allied industries do not check with those of the 1930 census. The census was taken in April, while the canning industry is seasonal, with peaks in August and September. Likewise the figures for metal industries, except iron and steel, do not compare favorably. This may be due to differences in classification. Except for the exceptions noted the number of workers employed in each type of industry is lower than it was in 1930. A study of Table 2 reveals that the sample was adequate and that just conclusions may be reached by the analysis of the raw data gathered.

TABLE 2—PERCENT AND NUMBER OF WORKERS SURVEYED, BASED ON THE OFFICE INDUSTRIAL FILE AND 1930 U. S. CENSUS

| INDUSTRIAL CLASSIFICATION | 1930 census Indiana | Total office industrial file census | Survey census | Percent surveyed of 1930 census | Percent surveyed of office file |
|---|------------------------|---|------------------|---------------------------------------|---------------------------------------|
| ALL INDUSTRIES OF TYPE SURVEYED..... | 404,059 | 328,432 | 247,817 | 61.3 | 75.5 |
| Extraction minerals..... | 24,034 | 8,207 | 4,704 | 19.6 | 57.3 |
| Coal mines..... | 17,210 | 7,030 | 4,125 | 24.0 | 58.7 |
| Extraction other minerals..... | 6,824 | 1,171 | 579 | 8.5 | 49.4 |
| Mechanical and manufacturing..... | 370,277† | 314,553 | 238,183 | 64.3 | 75.7 |
| Chemical and allied..... | 17,704 | 16,295 | 15,741 | 88.9 | 96.6 |
| Cigar and tobacco..... | 2,997 | 1,446 | 1,035 | 34.5 | 71.6 |
| Clay, glass and stone..... | 22,449 | 16,251 | 15,343 | 68.3 | 94.4 |
| Clothing..... | 18,891 | 18,114 | 17,456 | 92.4 | 96.4 |
| Food and allied..... | 25,901* | 47,430* | 35,464* | 100.0 | 74.8 |
| Iron and steel..... | 161,305‡ | 127,805 | 80,728 | 50.0 | 63.2 |
| Metal except iron and steel..... | 7,146 | 10,016 | 9,474 | 100.0 | 94.6 |
| Leather..... | 5,261 | 2,212 | 2,056 | 39.1 | 92.9 |
| Lumber and furniture..... | 30,662 | 21,462 | 18,757 | 61.2 | 87.4 |
| Paper and printing..... | 16,822 | 13,534 | 12,075 | 71.8 | 89.2 |
| Textiles..... | 8,694 | 9,068 | 8,232 | 94.7 | 90.8 |
| Miscellaneous mechanical and manufacturing..... | 52,445‡ | 30,920 | 21,822 | 41.6 | 70.6 |
| Domestic and personal service | | | | | |
| Dry cleaning and laundrying..... | 9,748 | 5,672 | 4,930 | 50.5 | 86.9 |

†Includes 45,372 in auto industry and 70,370 in other Iron and Steel Industries.

‡Includes 4,701 in Rubber Industry and 16,457 in Electric Machine Industry.

*Census taken in April. Canning Industry seasonal during August and September.

‡440,515 minus 61,339 for Building Industry and minus 8,899 for independent hand trades.

SIZE OF PLANTS

Data on the size distribution of plants and distribution of workers according to size of plants is shown in Tables 3 and 4, and figures 3 and 4. Approximately 63% of workers in all types of industry studied worked in plants employing less than 500 persons. 23% of the workers worked in plants employing less than 100. However, 78.5% of all plants studied were of the 5-100 employee classification, and 96.8% of the plants were of the 500 and less classification. The reason for selecting 500 workers as the dividing line in this study is based on the statement of Newquist, in his study for the American College of Surgeons, that establishments employing less than 500 workers could not carry on an economical medical service, as could larger plants.³ In order to render a service to these smaller plants which predominate in number and employ 63% of the workers, some neutral governmental agency may be valuable in this function.

TABLE 3—PERCENTAGE DISTRIBUTION OF PLANTS ACCORDING TO SIZE

| INDUSTRY OR SERVICE GROUP | Number of Plants | Percentage Distribution of Plants According to Size | | | | | | | | |
|--|------------------|---|-------|--------|---------|---------|----------|-----------|-----------|-------|
| | | 5-20 | 21-50 | 51-100 | 101-250 | 251-500 | 501-1000 | 1001-2500 | over 2500 | 5-100 |
| TOTAL—ALL PLANTS SURVEYED..... | 2,545 | 40.5 | 23.8 | 14.2 | 13.0 | 5.3 | 2.4 | 0.6 | 0.2 | 78.5 |
| Extraction of minerals..... | 74 | 51.3 | 20.3 | 6.8 | 16.2 | 4.1 | 1.3 | 0.0 | 0.0 | 78.4 |
| Manufacturing and mechanical | | | | | | | | | | |
| ¹ U. S. census, all states..... | | *49.7 | 23.2 | 11.6 | 9.5 | 3.5 | 1.6 | 0.7 | 0.2 | 84.5 |
| ¹ U. S. census, Indiana..... | | *44.6 | 22.7 | 12.9 | 12.0 | 4.2 | 2.1 | 1.1 | 0.4 | 80.2 |
| Indiana industrial hygiene survey..... | 2,309 | 39.7 | 22.8 | 14.7 | 13.6 | 5.7 | 2.6 | 0.6 | 0.3 | 77.2 |
| Chemical and allied..... | 107 | 46.7 | 26.2 | 12.2 | 3.7 | 3.7 | 4.7 | 1.9 | 0.9 | 85.1 |
| Cigar and tobacco..... | 10 | 50.0 | 30.0 | 0.0 | 10.0 | 0.0 | 10.0 | 0.0 | 0.0 | 80.0 |
| Clay, glass and stone..... | 169 | 33.1 | 29.0 | 18.9 | 10.1 | 5.9 | 2.4 | 0.6 | 0.0 | 81.0 |
| Clothing..... | 100 | 16.0 | 11.0 | 21.0 | 30.0 | 13.0 | 8.0 | 1.0 | 0.0 | 48.0 |
| Food and allied..... | 535 | 44.3 | 23.2 | 13.8 | 13.3 | 4.1 | 1.1 | 0.2 | 0.0 | 81.3 |
| Iron and steel..... | 480 | 31.4 | 19.4 | 17.5 | 17.3 | 8.8 | 3.5 | 1.5 | 0.6 | 68.3 |
| Metals other than iron and steel..... | 143 | 45.4 | 22.4 | 11.2 | 14.7 | 4.9 | 1.4 | 0.0 | 0.0 | 79.0 |
| Leather..... | 21 | 42.8 | 19.1 | 14.3 | 9.5 | 9.5 | 4.8 | 0.0 | 0.0 | 78.2 |
| Lumber and furniture..... | 287 | 33.4 | 30.6 | 18.5 | 12.9 | 3.5 | 1.1 | 0.0 | 0.0 | 82.5 |
| Paper, printing and allied..... | 272 | 54.0 | 24.3 | 9.6 | 10.3 | 1.5 | 0.3 | 0.0 | 0.0 | 87.9 |
| Textile..... | 51 | 62.7 | 5.9 | 7.8 | 9.8 | 5.9 | 3.9 | 2.0 | 2.0 | 76.4 |
| Miscellaneous manufacturing..... | 134 | 39.6 | 19.4 | 9.7 | 12.0 | 10.4 | 6.7 | 1.5 | 0.7 | 68.7 |
| Personal service | | | | | | | | | | |
| Laundries and dry cleaning..... | 162 | 46.9 | 38.9 | 10.5 | 3.1 | 0.6 | 0.0 | 0.0 | 0.0 | 96.3 |

¹United States Census figures for manufacturing and mechanical industries, 1929.

*6 to 20 in United States Census figures.

TABLE 4—PERCENTAGE DISTRIBUTION OF WORKERS ACCORDING TO SIZE OF PLANTS

| INDUSTRY OR SERVICE GROUP | Number of Workers | Percentage Distribution of Workers by Plant Size | | | | | | | | |
|--|-------------------|--|-------|--------|---------|---------|----------|-----------|-----------|-------|
| | | 5-20 | 21-50 | 51-100 | 101-250 | 251-500 | 501-1000 | 1001-2500 | Over 2500 | 5-100 |
| TOTAL—ALL PLANTS SURVEYED..... | 247,817 | 4.8 | 7.8 | 10.4 | 21.0 | 18.9 | 15.9 | 8.8 | 12.4 | 23.0 |
| Extraction of minerals..... | 4,704 | 9.1 | 8.6 | 6.7 | 46.6 | 17.3 | 11.7 | 0.0 | 0.0 | 24.4 |
| Manufacturing and Mechanical— | | | | | | | | | | |
| ¹ U. S. Census, all states..... | | *6.9 | 9.5 | 10.4 | 18.6 | 15.6 | 13.7 | 13.4 | 11.9 | 26.8 |
| ¹ U. S. Census, Indiana..... | | *4.6 | 7.2 | 8.9 | 17.3 | 13.7 | 13.4 | 15.1 | 19.8 | 20.7 |
| Indiana Industrial Hygiene survey..... | 238,183 | 4.4 | 7.1 | 10.3 | 20.6 | 19.3 | 16.3 | 9.1 | 12.9 | 21.8 |
| Chemical and allied..... | 15,741 | 3.4 | 5.7 | 6.1 | 3.8 | 10.4 | 21.9 | 20.8 | 27.9 | 15.2 |
| Cigar and tobacco..... | 1,035 | 7.7 | 8.1 | 0.0 | 17.2 | 0.0 | 67.0 | 0.0 | 0.0 | 15.8 |
| Clay, glass and stone..... | 15,343 | 4.1 | 10.4 | 14.9 | 18.2 | 22.4 | 17.6 | 12.4 | 0.0 | 29.4 |
| Clothing..... | 17,456 | 1.3 | 1.9 | 8.2 | 25.8 | 27.4 | 26.3 | 9.1 | 0.0 | 11.4 |
| Food and allied..... | 35,464 | 7.4 | 11.5 | 15.5 | 29.5 | 21.7 | 10.6 | 3.8 | 0.0 | 34.4 |
| Iron and steel..... | 80,728 | 2.2 | 3.8 | 7.6 | 16.8 | 18.3 | 14.7 | 12.4 | 24.2 | 13.6 |
| Metals other than iron and steel..... | 9,474 | 8.0 | 10.8 | 11.9 | 31.6 | 23.2 | 14.5 | 0.0 | 0.0 | 30.7 |
| Leather..... | 2,056 | 4.4 | 5.6 | 11.3 | 11.4 | 42.6 | 24.7 | 0.0 | 0.0 | 21.3 |
| Lumber and furniture..... | 18,757 | 6.2 | 15.7 | 20.2 | 30.6 | 16.4 | 10.9 | 0.0 | 0.0 | 42.1 |
| Paper, printing and allied..... | 12,075 | 14.4 | 16.8 | 15.0 | 38.4 | 11.1 | 4.3 | 0.0 | 0.0 | 46.2 |
| Textile..... | 8,232 | 4.2 | 1.1 | 3.5 | 9.9 | 12.3 | 17.7 | 13.6 | 37.7 | 8.8 |
| Miscellaneous manufacturing..... | 21,822 | 2.2 | 3.6 | 3.9 | 11.9 | 22.4 | 27.3 | 11.7 | 17.0 | 9.7 |
| Personal Service— | | | | | | | | | | |
| Laundries and dry cleaning..... | 4,930 | 19.7 | 40.1 | 22.7 | 12.1 | 5.4 | 0.0 | 0.0 | 0.0 | 82.5 |

¹United States Census figures for manufacturing and mechanical industries, 1929.

*6 to 20 in United States census figures.

A graphic comparison is given in Figure 3 of the data presented in the Indiana survey to the country as a whole. In the main, the same situations prevail in Indiana as for the United States in general. Figure 4 gives the cumulative percent distribution of workers according to size of plants with a comparison of the United States census, the Indiana census, and survey.

FIGURE 3

Percentage Distribution of plants and workers Manufacturing & Mechanical Industries According to the size of plant

■ U.S. CENSUS ■ INDIANA 1929 INDIANA SURVEY ■

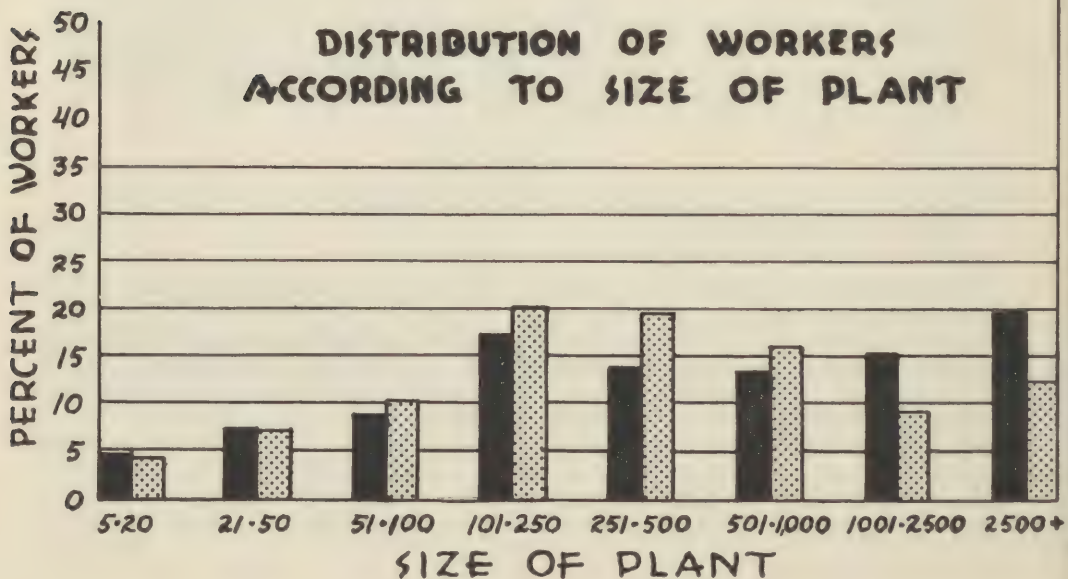
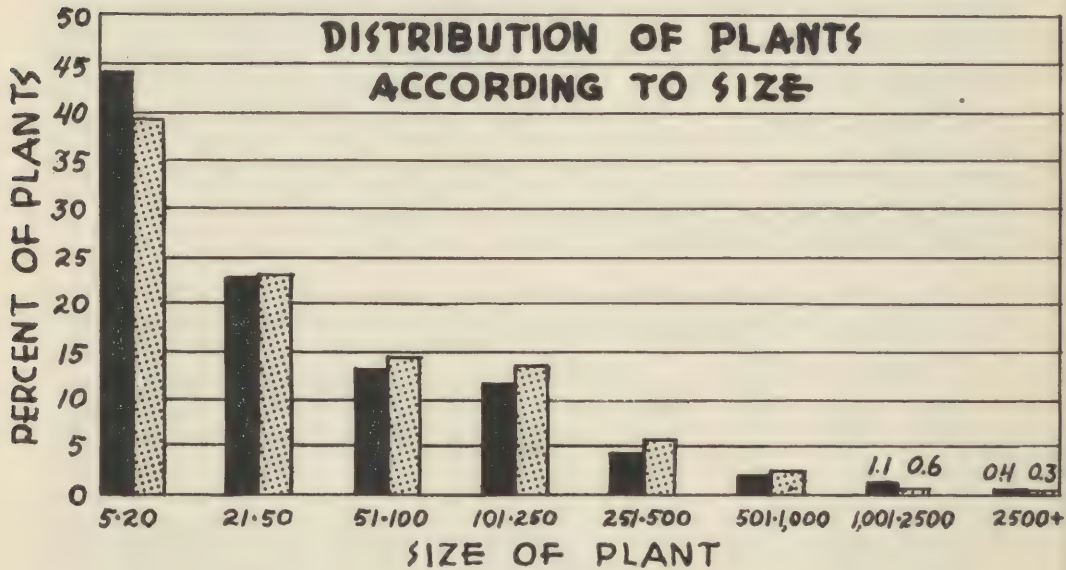


FIGURE 4

**Cumulative Percentage Distribution
of Plants in Manufacturing & Mechanical Industries
According to Size of Plant**

PERCENT OF TOTAL WORKERS EMPLOYED IN PLANTS
SMALLER THAN STATED SIZE

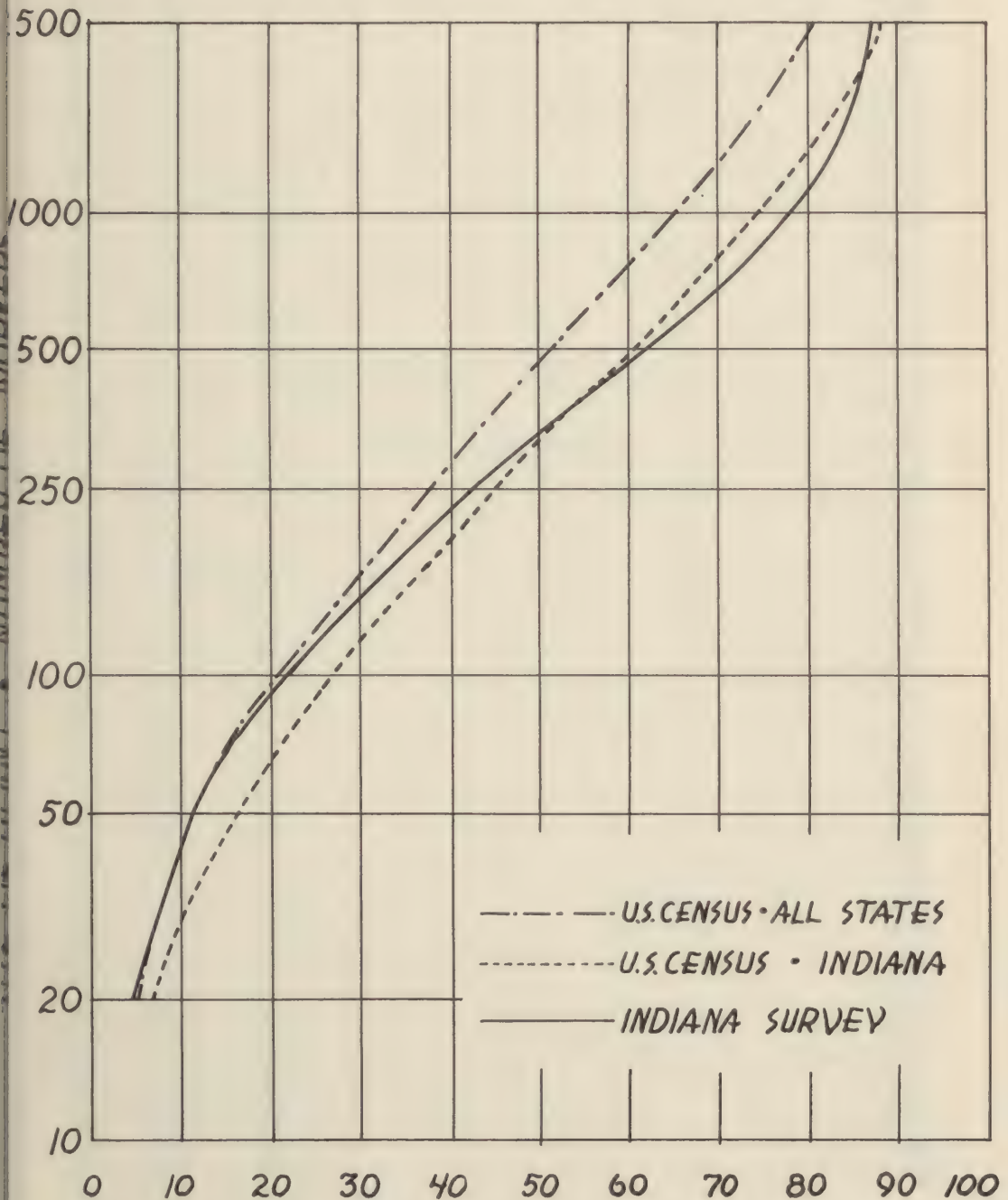


Table 3A shows the distribution of surveyed plants and workers by counties. Plants were visited in 87 counties. Five counties were not included in the sample surveyed due to the fact that these counties are small and agricultural.

TABLE 3A—DISTRIBUTION OF SURVEYED PLANTS AND WORKERS BY COUNTIES

| COUNTY | Number Plants | Total Population | Male | Female |
|------------------|------------------|---------------------|---------|--------|
| Adams..... | 21 | 1,832 | 1,381 | 451 |
| Allen..... | 136 | 11,511 | 8,376 | 3,135 |
| Bartholomew..... | 44 | 2,230 | 1,765 | 465 |
| Benton..... | 2 | 61 | 34 | 27 |
| Blackford..... | 16 | 1,103 | 681 | 422 |
| Boone..... | 13 | 502 | 288 | 214 |
| Carroll..... | 5 | 61 | 56 | 5 |
| Cass..... | 34 | 2,016 | 1,177 | 839 |
| Clark..... | 15 | 1,526 | 1,200 | 326 |
| Clay..... | 21 | 765 | 670 | 95 |
| Clinton..... | 15 | 1,482 | 967 | 515 |
| Crawford..... | 4 | 194 | 192 | 2 |
| Daviess..... | 8 | 716 | 517 | 199 |
| Dearborn..... | 14 | 1,655 | 1,359 | 296 |
| Decatur..... | 11 | 349 | 207 | 142 |
| Dekalb..... | 13 | 1,118 | 691 | 527 |
| Delaware..... | 70 | 9,479 | 7,877 | 1,602 |
| Dubois..... | 46 | 2,342 | 2,036 | 306 |
| Elkhart..... | 116 | 8,569 | 6,498 | 2,071 |
| Fayette..... | 17 | 1,861 | 1,658 | 203 |
| Floyd..... | 33 | 2,601 | 1,498 | 1,103 |
| Fountain..... | 11 | 650 | 600 | 50 |
| Franklin..... | 1 | 48 | 36 | 12 |
| Fulton..... | 4 | 117 | 97 | 20 |
| Gibson..... | 9 | 879 | 805 | 74 |
| Grant..... | 64 | 7,231 | 4,896 | 2,335 |
| Greene..... | 14 | 522 | 486 | 36 |
| Hamilton..... | 12 | 881 | 609 | 272 |
| Hancock..... | 8 | 650 | 247 | 403 |
| Harrison..... | 6 | 388 | 373 | 15 |
| Henry..... | 32 | 4,053 | 3,308 | 745 |
| Howard..... | 38 | 6,327 | 4,783 | 1,544 |
| Huntington..... | 22 | 1,765 | 1,246 | 519 |
| Jackson..... | 29 | 2,214 | 1,089 | 1,125 |
| Jay..... | 22 | 2,908 | 1,850 | 1,058 |
| Jefferson..... | 9 | 233 | 160 | 73 |
| Jennings..... | 5 | 220 | 95 | 125 |
| Johnson..... | 15 | 2,037 | 1,083 | 954 |
| Knox..... | 23 | 2,164 | 1,789 | 375 |
| Kosciusko..... | 20 | 783 | 628 | 155 |
| Lagrange..... | 1 | 28 | 28 | 0 |
| Lake..... | 153 | 38,813 | 33,007 | 3,806 |
| LaPorte..... | 63 | 7,008 | 5,170 | 1,838 |
| Lawrence..... | 24 | 1,912 | 1,388 | 524 |
| Madison..... | 101 | 8,533 | 5,834 | 2,699 |
| Marion..... | 388 | 37,173 | 26,259 | 10,914 |
| Marshall..... | 12 | 571 | 454 | 117 |
| Martin..... | 5 | 126 | 119 | 7 |
| Miami..... | 24 | 1,948 | 1,194 | 754 |
| Monroe..... | 42 | 2,089 | 1,934 | 155 |
| Montgomery..... | 23 | 981 | 627 | 354 |
| Morgan..... | 12 | 570 | 455 | 115 |
| Newton..... | 2 | 38 | 29 | 9 |
| Noble..... | 17 | 1,243 | 773 | 470 |
| Ohio..... | 1 | 54 | 52 | 2 |
| Orange..... | 8 | 326 | 255 | 71 |
| Owen..... | 3 | 73 | 64 | 9 |
| Parke..... | 6 | 143 | 141 | 2 |
| Perry..... | 13 | 1,270 | 943 | 327 |
| Pike..... | 2 | 88 | 88 | 0 |
| Porter..... | 10 | 682 | 510 | 172 |
| Posey..... | 6 | 385 | 201 | 184 |
| Pulaski..... | 3 | 102 | 18 | 84 |
| Putnam..... | 7 | 409 | 372 | 37 |
| Randolph..... | 18 | 1,979 | 1,453 | 526 |
| Ripley..... | 8 | 824 | 759 | 65 |
| Rush..... | 15 | 872 | 527 | 345 |
| St. Joseph..... | 123 | 20,206 | 14,789 | 5,417 |
| Scott..... | 3 | 1,422 | 726 | 696 |
| Shelby..... | 21 | 1,716 | 1,035 | 681 |
| Spencer..... | 9 | 295 | 160 | 135 |
| Starke..... | 2 | 161 | 44 | 117 |
| Steuben..... | 4 | 73 | 61 | 12 |
| Sullivan..... | 8 | 552 | 542 | 10 |
| Tippecanoe..... | 25 | 2,018 | 1,652 | 366 |
| Tipton..... | 10 | 1,042 | 431 | 611 |
| Union..... | 2 | 167 | 164 | 3 |
| Vanderburgh..... | 138 | 11,154 | 8,521 | 2,633 |
| Vermillion..... | 13 | 680 | 571 | 109 |
| Vigo..... | 95 | 6,330 | 5,124 | 1,206 |
| Wabash..... | 29 | 1,870 | 1,476 | 394 |
| Warrick..... | 8 | 186 | 89 | 97 |
| Washington..... | 8 | 479 | 245 | 234 |
| Wayne..... | 60 | 5,140 | 3,782 | 1,358 |
| Wells..... | 10 | 261 | 201 | 60 |
| White..... | 3 | 624 | 511 | 113 |
| Whitley..... | 9 | 1,158 | 545 | 613 |
| Total..... | 2,545 | 247,817 | 186,531 | 61,286 |

•
INDUSTRIAL WELFARE
PROVISIONS
•



An example of good practices by a small foundry. Note the good "housekeeping," enclosed sand-blasting room, local exhaust on grinding wheels, and display case of various devices used in the plant.

Courtesy Decatur Castings Company, Decatur, Indiana.

Industrial Welfare Provisions

In view of the far-reaching and favorable influence which industrial health programs have been known to exert in industry, it was deemed desirable to obtain some information of the extent that various welfare services were available to workers of the groups studied. The data were collected under these major headings: Safety Organizations, Medical Provisions, Morbidity Statistics and General Sanitation.

Safety Organizations

The services of a full time safety director were available to 24.9% of the workers, while 21.0% had services of a safety director who donated at least part of his time to such work. 46.3% of workers had services of shop committees that are engaged in promoting safety and 81.2% of the workers in the survey group received some safety service from insurance companies. 51.8% of the workers received some type of safety service other than insurance companies. (See Table 5 for further analysis of the problem.)

TABLE 5—INDUSTRIAL WELFARE PROVISIONS
SAFETY ORGANIZATION

| INDUSTRY OR SERVICE GROUP | Number of Plants | Number of Workers | Percentage of Workers to Whom Service is Available | | | | |
|---|------------------|-------------------|--|-----------|----------------|-----------|-------------------------|
| | | | Safety Director | | Shop Committee | Insurance | Other Safety activities |
| | | | Full time | Part time | | | |
| ALL INDUSTRIES STUDIED..... | 2,545 | 247,817 | 24.9 | 21.0 | 46.3 | 81.2 | 51.8 |
| Extraction minerals..... | 74 | 4,704 | 11.6 | 55.0 | 18.8 | 94.0 | 67.7 |
| Coal mines..... | 47 | 4,125 | 13.3 | 57.6 | 18.5 | 96.7 | 70.0 |
| Quarries..... | 27 | 579 | 0.0 | 36.1 | 20.7 | 74.8 | 51.3 |
| Manufacturing and mechanical..... | 2,309 | 238,183 | 25.7 | 20.7 | 47.7 | 80.9 | 52.1 |
| Chemical and allied..... | 107 | 15,741 | 69.8 | 11.5 | 72.4 | 96.3 | 81.8 |
| Cigar and tobacco..... | 10 | 1,035 | 0.0 | 0.0 | 0.0 | 73.3 | 86.1 |
| Clay, glass and stone..... | 169 | 15,343 | 22.3 | 24.2 | 33.6 | 88.3 | 53.0 |
| Clothing..... | 100 | 17,456 | 0.0 | 6.0 | 28.3 | 77.4 | 31.4 |
| Food and allied..... | 535 | 35,464 | 3.8 | 18.3 | 25.0 | 83.7 | 37.6 |
| Iron and steel..... | 480 | 80,728 | 44.2 | 20.8 | 64.6 | 68.0 | 65.7 |
| Metal industry except iron and steel..... | 143 | 9,474 | 16.5 | 30.1 | 43.6 | 93.2 | 61.2 |
| Leather..... | 21 | 2,056 | 0.0 | 21.5 | 45.2 | 74.6 | 59.1 |
| Lumber and furniture..... | 287 | 18,757 | 0.0 | 18.6 | 32.0 | 91.0 | 31.3 |
| Paper and printing..... | 272 | 12,075 | 2.9 | 12.2 | 26.5 | 83.6 | 33.5 |
| Textiles..... | 51 | 8,232 | 0.0 | 48.9 | 20.5 | 97.1 | 5.3 |
| Miscellaneous manufacturing industries..... | 134 | 21,822 | 36.3 | 32.4 | 69.0 | 89.3 | 58.2 |
| Domestic and personal service..... | 162 | 4,930 | 0.0 | 4.1 | 5.5 | 81.5 | 26.3 |
| Laundries..... | 101 | 3,781 | 0.0 | 5.4 | 7.2 | 82.0 | 30.2 |
| Cleaning, dyeing and pressing shops..... | 61 | 1,149 | 0.0 | 0.0 | 0.0 | 79.9 | 13.6 |

Since it is not possible to interpret the significance of this data in terms of lost-time accidents, deaths, etc., no definite conclusions may be drawn. However, accident rates computed by the United States Bureau of Labor Statistics⁶ for a group of steel companies which have followed the best practices and had achieved the most pronounced success in accident prevention showed that the accident frequency rate for this group of companies was 8.1 industrial accidents per million man hours worked against 18.1 for the industry as a whole.

Medical Provisions

Table 6 indicates that 4.1% of the workers of the group surveyed had services of a company-owned hospital while 9.0% were employed by companies having a definite service contract with some hospital. First aid rooms were available to 55% of the employees and 88% had the use of a first-aid kit. 49.8% of workers had the services of a trained first aid worker. This figure is much higher for the mining industry and due credit should be given them for their extensive first aid programs.

TABLE 6—INDUSTRIAL WELFARE PROVISIONS—MEDICAL

| INDUSTRY OR SERVICE GROUP | Number of plants | Number of workers | Percent of Workers to Whom Service is Available | | | | | | | | |
|---|------------------|-------------------|---|-----------|----------------|---------------|--------------------------|-----------|-----------|-----------|-----------|
| | | | Hospital | | First Aid room | First Aid kit | Trained first Aid worker | Physician | | Nurse | |
| | | | Com-pany | Con-tract | | | | Full time | Part time | Full time | Part time |
| ALL INDUSTRIES..... | 2,545 | 247,817 | 4.1 | 9.0 | 55.0 | 88.0 | 49.8 | 10.0 | 18.5 | 35.5 | 0.8 |
| Extraction minerals..... | 74 | 4,704 | 0.0 | 0.0 | 48.3 | 97.9 | 90.7 | 0.0 | 4.3 | 0.0 | 0.0 |
| Coal mines..... | 47 | 4,125 | 0.0 | 0.0 | 50.2 | 98.5 | 97.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| Quarries..... | 27 | 579 | 0.0 | 0.0 | 35.1 | 93.3 | 44.0 | 0.0 | 35.1 | 0.0 | 0.0 |
| Manufacturing and mechanical..... | 2,309 | 238,183 | 4.2 | 9.4 | 56.1 | 87.7 | 49.8 | 10.4 | 19.1 | 36.9 | 0.9 |
| Chemical and allied..... | 107 | 15,741 | 17.8 | 51.3 | 82.3 | 48.8 | 46.8 | 32.9 | 33.8 | 76.0 | 0.8 |
| Cigar and tobacco..... | 10 | 1,035 | 0.0 | 0.0 | 87.9 | 100.0 | 4.0 | 0.0 | 0.0 | 0.0 | 67.0 |
| Clay, glass and stone..... | 169 | 15,343 | 0.0 | 14.5 | 45.5 | 95.6 | 48.5 | 0.4 | 27.3 | 27.5 | 0.0 |
| Clothing..... | 100 | 17,456 | 0.0 | 3.0 | 55.2 | 98.3 | 19.5 | 0.0 | 0.0 | 17.8 | 0.0 |
| Food and allied..... | 535 | 35,464 | 0.0 | 0.3 | 32.6 | 97.3 | 41.2 | 0.0 | 2.9 | 11.9 | 1.4 |
| Iron and steel..... | 480 | 80,728 | 5.7 | 13.5 | 73.8 | 84.9 | 65.6 | 22.2 | 28.0 | 52.7 | 0.7 |
| Metal industry except iron and steel..... | 143 | 9,474 | 6.9 | 2.9 | 51.7 | 94.8 | 66.8 | 0.0 | 6.2 | 19.3 | 0.0 |
| Leather..... | 21 | 2,056 | 0.0 | 0.0 | 53.8 | 99.6 | 29.9 | 0.0 | 1.0 | 24.7 | 0.0 |
| Lumber and furniture..... | 287 | 18,757 | 0.0 | 0.7 | 24.7 | 97.8 | 34.3 | 0.0 | 5.2 | 9.8 | 1.0 |
| Paper and printing..... | 272 | 12,075 | 0.0 | 1.7 | 25.0 | 96.3 | 19.8 | 0.0 | 0.0 | 4.3 | 0.0 |
| Textiles..... | 51 | 8,232 | 0.0 | 0.0 | 73.9 | 81.9 | 13.1 | 0.0 | 44.5 | 69.0 | 0.0 |
| Misc. manufacturing and mechanical..... | 134 | 21,822 | 9.3 | 0.0 | 56.3 | 80.7 | 72.8 | 7.0 | 32.9 | 53.6 | 0.0 |
| Domestic and personal service..... | 162 | 4,930 | 0.0 | 0.0 | 7.8 | 94.2 | 9.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| Laundries..... | 101 | 3,781 | 0.0 | 0.0 | 8.1 | 95.0 | 12.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cleaning, dyeing and pressing shops..... | 61 | 1,149 | 0.0 | 0.0 | 6.6 | 91.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |



First-aid competition teams from various Indiana mines, participating in a meet at Sullivan. Given emergency problems are judged as to time, accuracy and methods.

It was further learned that 10% of the workers had the services of a full time physician and 18.5% were cared for by a part time physician. This does not indicate that the remaining workers did not have medical services in the event of an injury or illness, but it does indicate that medical services were largely of the "on call" type and not readily available.

More than 35% of the workers had the services of a full time plant nurse. Part time nursing services were reported in less than 1%. The part time services were furnished by life insurance companies or by the Visiting Nurses Association. This service, in our opinion, could be profitably increased in Indiana.

Disability Benefits and Records

The value of keeping accident and sickness records is well recognized. Such records serve to indicate the extent of the problem and at times have been the means of initiating studies designed for the correction of those conditions revealed by an analysis of the records. A typical example of such a case is the study of the pneumonia problem in the steel industry, undertaken by the United States Public Health Service, as a result of the information disclosed by an analysis of records furnished by a group of steel industries.⁷ It was with this same view in mind that the State Board of Health advocated the reporting of occupational diseases by physicians.

The study indicated that accident records were kept for 98.3% of the workers and sickness records for 56.7% of the workers. Sick benefit associations were reported as existing for the benefit of 50.3% of the employees. There is a close parallel between the existence of sick benefit organizations and the keeping of sickness records. These records are undoubtedly kept by insurance companies.

TABLE 7—INDUSTRIAL WELFARE PROVISIONS
DISABILITY STATISTICS

| INDUSTRY OR SERVICE GROUP | Number of plants | Number of workers | Percent of Workers to Whom Indicated Facility is Available | | |
|---|------------------|-------------------|--|------------------|------------------|
| | | | Sick benefit association | Sickness records | Accident records |
| ALL INDUSTRIES..... | 2,545 | 247,817 | 50.3 | 56.7 | 98.3 |
| Extraction minerals..... | 74 | 4,704 | 10.1 | 8.6 | 99.5 |
| Coal mines..... | 47 | 4,125 | 7.2 | 7.2 | 99.6 |
| Quarries..... | 27 | 579 | 30.7 | 18.1 | 99.1 |
| Mechanical and manufacturing..... | 2,309 | 238,183 | 51.8 | 53.3 | 98.5 |
| Chemical and allied..... | 107 | 15,741 | 78.9 | 82.1 | 96.4 |
| Cigar and tobacco..... | 10 | 1,035 | 67.0 | 68.9 | 97.7 |
| Clay, glass and stone..... | 169 | 15,343 | 51.1 | 53.7 | 99.5 |
| Clothing..... | 100 | 17,456 | 24.5 | 28.7 | 97.8 |
| Food and allied..... | 535 | 35,464 | 29.2 | 31.3 | 97.4 |
| Iron and steel..... | 480 | 80,728 | 68.6 | 77.5 | 99.3 |
| Metal industry except iron and steel..... | 143 | 9,474 | 39.1 | 43.5 | 99.8 |
| Leather..... | 21 | 2,056 | 72.0 | 51.6 | 99.8 |
| Lumber and furniture..... | 287 | 18,757 | 30.4 | 32.4 | 98.9 |
| Paper and printing..... | 272 | 12,075 | 37.2 | 38.3 | 96.1 |
| Textiles..... | 51 | 8,232 | 21.6 | 59.3 | 98.7 |
| Miscellaneous..... | 134 | 21,822 | 67.6 | 76.1 | 99.6 |
| Domestic and personal service..... | 162 | 4,930 | 23.0 | 27.1 | 88.8 |
| Laundries..... | 101 | 3,781 | 23.3 | 27.5 | 91.6 |
| Cleaning, dyeing and pressing shops..... | 61 | 1,149 | 22.0 | 26.1 | 79.3 |

Table 8 and Figure 5 compare industrial health services in plants with 100 or more workers with plants having less than 100 workers. For practically all the listed industrial welfare facilities discussed, the larger plants had the greater percentage of workers furnished with such provisions. However, even some of these larger plants were deficient in medical and nursing services, and disability records. Again it should be emphasized that the majority of plants in Indiana are small.

Table 9 shows the comparison of the Indiana findings with similar studies by other States^{8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18}. These studies have shown that about comparable circumstances exist throughout the nation.

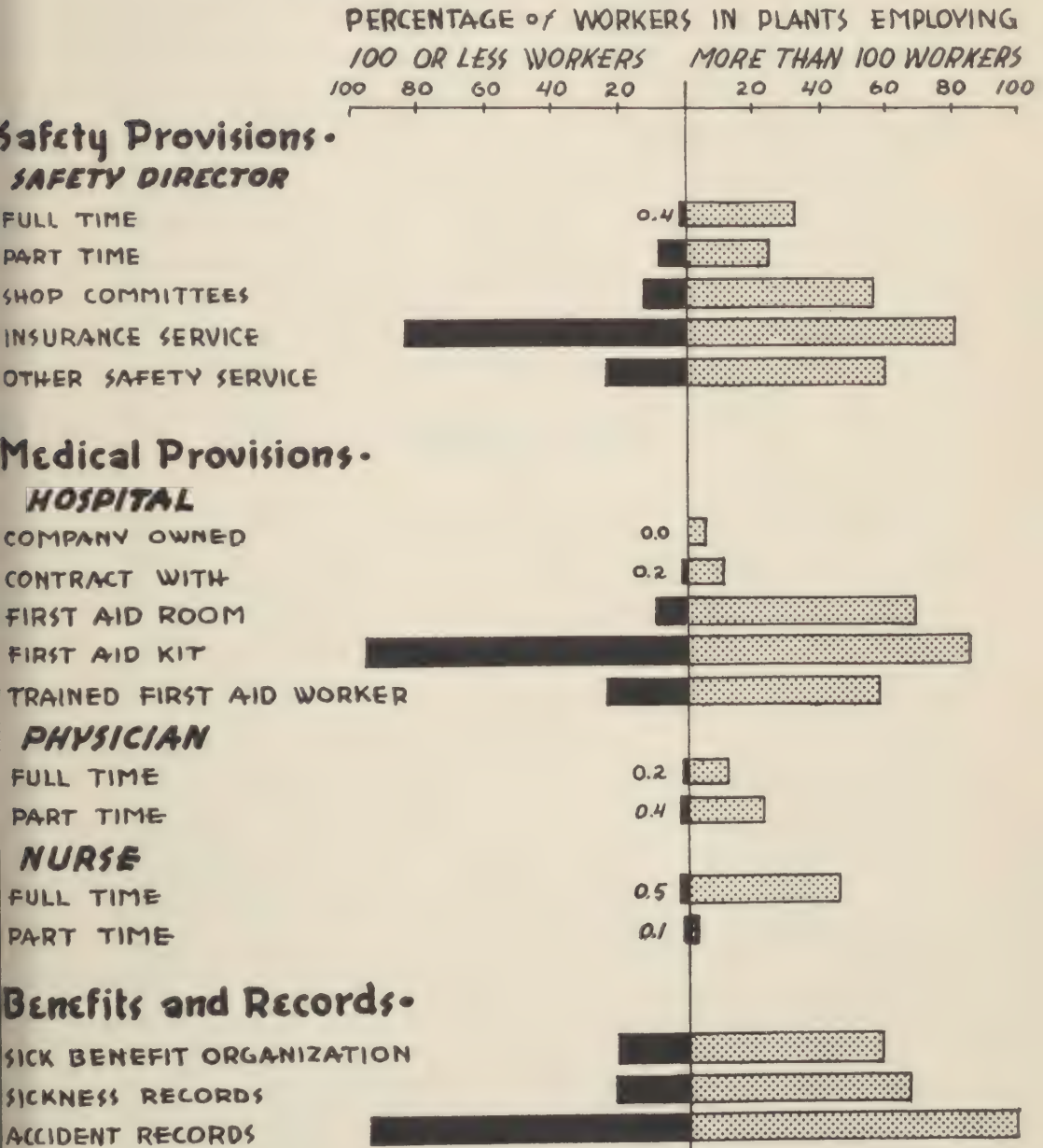
TABLE 8—COMPARISON OF INDUSTRIAL WELFARE PROVISIONS IN PLANTS EMPLOYING 100 OR LESS WORKERS WITH PLANTS HAVING MORE THAN 100 WORKERS

| INDUSTRIAL WELFARE PROVISIONS | Percentage of Workers with Indicated Service in Plants Employing— | |
|--------------------------------|---|-----------------------|
| | 100 or less Workers | More than 100 Workers |
| Safety provisions— | | |
| Safety director: | | |
| Full time..... | 0.4 | 32.3 |
| Part time..... | 7.5 | 25.1 |
| Shop committees..... | 12.0 | 56.6 |
| Insurance service..... | 83.2 | 80.6 |
| Other safety service..... | 23.6 | 60.3 |
| Medical provisions— | | |
| Hospital: | | |
| Company owned..... | 0.0 | 5.3 |
| Contract with..... | 0.2 | 11.7 |
| First aid room..... | 8.2 | 69.0 |
| First aid kit..... | 95.2 | 85.9 |
| Trained first aid worker..... | 23.2 | 57.7 |
| Physician: | | |
| Full time..... | 0.2 | 12.9 |
| Part time..... | 0.4 | 23.9 |
| Nurse: | | |
| Full time..... | 0.5 | 46.1 |
| Part time..... | 0.1 | 1.1 |
| Benefits and records— | | |
| Sick benefit organization..... | 19.5 | 59.5 |
| Sickness records..... | 20.7 | 67.5 |
| Accident records..... | 94.3 | 99.5 |

TABLE 9—COMPARISON OF INDUSTRIAL HEALTH SERVICES IN INDIANA INDUSTRIES WITH SIMILAR DATA FROM OTHER STATES

| KIND OF SERVICE | Percentage of Workers with Indicated Services | | | | | | | | | | | |
|---|---|------|------|------|------|-------|-------|-------|------|------|-------|------|
| | Ind. | Ill. | Ohio | Md. | Va. | S. C. | Colo. | Idaho | Utah | Me. | N. H. | Ark. |
| Safety provisions— | | | | | | | | | | | | |
| Safety director—Full time..... | 24.9 | 21.7 | 37.8 | 37.6 | 17.8 | 0.0 | 30.8 | 6.3 | 38.8 | 12.7 | 12.3 | 12.4 |
| Safety director—Part time..... | 21.0 | 30.5 | 24.2 | 20.8 | 27.6 | 4.1 | 21.1 | 35.5 | 17.4 | 41.4 | 14.0 | (a) |
| Shop committee..... | 46.3 | 5.8 | 48.2 | 59.3 | 61.5 | 55.7 | 40.3 | 24.7 | 46.3 | 59.2 | 33.2 | 30.8 |
| Insurance service..... | 81.2 | 90.5 | (a) | 97.8 | 98.7 | (a) | 91.6 | 99.4 | 61.3 | (a) | 92.9 | (a) |
| Other safety provisions..... | 51.8 | 41.7 | (a) | 56.5 | 80.7 | 36.1 | 35.3 | 40.7 | 48.0 | (a) | 0.7 | (a) |
| Medical provisions— | | | | | | | | | | | | |
| Hospital—Company..... | 4.1 | 0.4 | 18.5 | 25.8 | 17.2 | (a) | 22.5 | 10.1 | 25.5 | 4.5 | 1.4 | (a) |
| Hospital—Contract..... | 9.0 | 8.9 | (a) | (a) | (a) | (a) | 11.3 | 53.2 | 43.8 | (a) | 0.8 | (a) |
| First aid room..... | 55.0 | 54.5 | 55.1 | 55.8 | 50.0 | 35.0 | 36.2 | 51.0 | 62.2 | 51.3 | 47.3 | (a) |
| First aid kit..... | 88.0 | 97.0 | 90.1 | 97.7 | 97.5 | 67.3 | 89.2 | 96.8 | 90.6 | 76.9 | 99.2 | (a) |
| Trained first aid workers..... | 49.8 | 33.7 | 51.8 | 65.4 | 64.7 | (a) | 46.7 | 58.3 | 72.6 | 45.2 | 39.2 | (a) |
| Physician—Full time..... | 10.0 | 9.7 | 22.1 | 30.7 | 21.0 | 0.0 | 23.8 | 10.0 | 30.5 | 0.5 | 4.5 | 10.1 |
| Physician—Part time..... | 18.5 | 20.2 | 27.8 | 42.4 | 25.6 | 24.2 | 9.1 | 17.7 | 19.0 | 26.8 | 4.3 | 2.1 |
| Nurse—Full time..... | 35.5 | 32.2 | 43.1 | 40.3 | 30.6 | 23.8 | 29.5 | 16.8 | 25.2 | 33.8 | 21.2 | 8.7 |
| Nurse—Part time..... | 0.8 | 1.5 | 1.9 | 0.0 | 1.9 | 3.7 | 1.3 | 0.1 | 4.9 | 1.9 | 1.7 | 1.7 |
| Disability benefits and records— | | | | | | | | | | | | |
| Sick benefit organizations..... | 50.3 | 44.2 | 43.9 | 47.8 | 35.1 | (a) | 44.5 | 36.0 | 64.6 | 31.7 | 28.7 | 19.4 |
| Sickness records..... | 56.7 | 42.3 | 49.8 | 54.5 | 34.1 | 26.8 | 38.9 | 38.5 | 65.3 | 35.5 | 29.3 | 22.8 |
| Accident records..... | 98.3 | 97.5 | 87.2 | 96.9 | 98.5 | 98.2 | 89.9 | 99.3 | 98.9 | 97.7 | 99.1 | 61.8 |

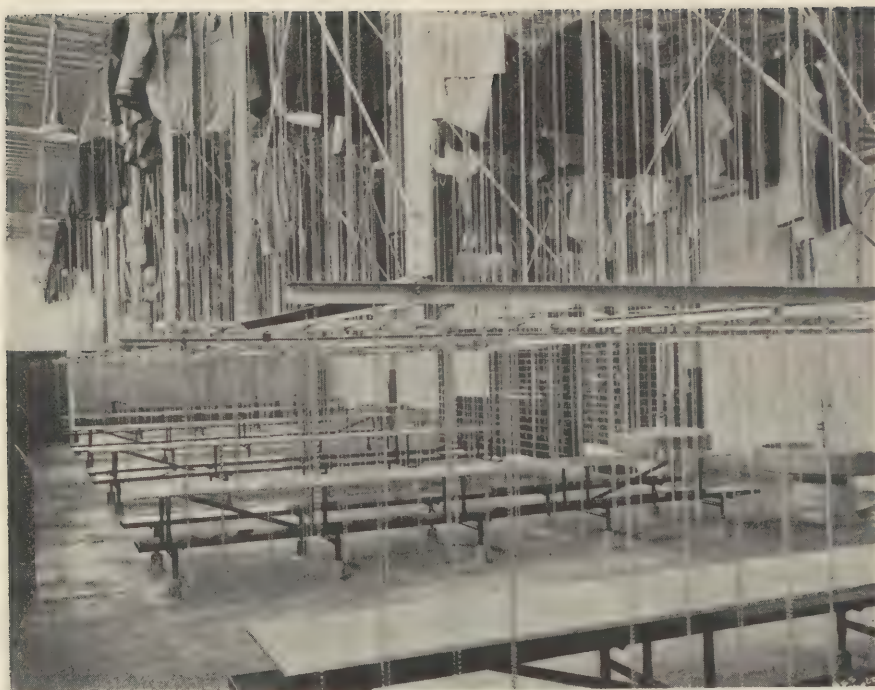
(a) Data not available.

FIGURE 5**Comparison of Industrial Welfare Provisions
in Large & Small Plants**

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SANITATION

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One method of having clean locker rooms. Note the use of chain lockers, Bradley wash fountains and shower baths.



Washroom, showing conventional lockers; approved wash basins and showers.
—Courtesy Bradley Company.

Sanitation

Table 10 is a summary of the drinking, washing and toilet facilities that Indiana industry provides for its employees. For the purpose of this table, the maximum number of workers that would be in the plant at any one time was taken. If a plant worked one shift, the maximum number of employees was taken; if three shifts, the largest shift was taken. Actual numbers of the various types of fixtures were obtained and, from the number of employees, it was possible to compute the ratio or number of persons per facility for each industrial group. For example, the average ratio for all industries was 34 persons per fountain. This figure represents the ratio only for those plants providing one or more fountains, there being 12.7% of workers having no fountains at all. The same is true for all of the other ratios in Table 10. The smaller the ratio, the better that industry is equipped with the particular facility.

In obtaining the ratio of males and females per toilet facility, the total values obtained by adding the number of flush toilets, pit privies and other types of toilets according to sex were divided into the number of males and females employed by those plants providing one or more toilets of any kind. The grand averages were found to be 15 males per toilet facility and 13 females per facility, 1.2% and 1.7% of the workers, respectively, had no toilet facilities.

Ehlers and Steel¹⁰ gave recommended ratios, which are compared graphically with the ratios obtained in the survey in Figure 6. The average figures found in the survey compare quite favorably with the recommended figures except in the case of showers. It was found that many plants had no showers at all, or possibly one in the boiler room, whereas no showers were provided for the main body of employees. It will also be noted that ratios found in the extraction of minerals industry are entirely out of line with the other results. This is due to the fact that the work is underground and it is difficult to provide drinking and toilet facilities for mine workers. However, this industry is well provided with showers, the ratio being one for every 14 employees on the average.

Merely because the average ratios for an industry are equal to or better than the recommended ratios does not mean that this industry is well equipped with sanitation facilities. It is also necessary to consider the percentage of employees having no facilities at all. For example, in the extraction of minerals industry, 68.6% of all of the employees have no fountains provided and about half of the employees have no lavatory facilities. This is a very important point, because one is liable to assume that Indiana industries provide sufficient facilities, especially if it is judged on the basis of ratios alone. It should be remembered that these ratios were computed only on the basis of the number of workers in plant providing one or more of the facilities; workers in plants providing no facilities were omitted.

One other point should be mentioned in connection with the number and location of sanitation facilities. The layout and size of the plant, as well as the type of industry, must be considered when providing facilities. Foundries and machine shops certainly require more washing facilities than do glove or clothing factories. Each plant, therefore, presents its own problem and recommended ratios are merely approximate numbers prescribed for industry as a whole.

Faulty plumbing has been overlooked generally in industrial sanitation because communicable diseases have not been considered as important as industrial poisonings or accidents. However, it has been stated by one

authority²⁰ on this subject that "there have been more cases of illness among industrial employees . . . resulting from defective plumbing than from any other one industrial source in recent years." The reason for this is that a contaminated water supply affects all of the employees in a plant while the number of employees exposed to *great* danger from harmful materials is usually only a small part of the total personnel.



*EHLERS & STEEL—"Municipal and Rural Sanitation" •McGraw-Hill•37.

Cross-connection with unsafe water supplies is probably the leader in the production of disease due to faulty plumbing. Dual water supplies immediately create this possibility. It can be seen from Table 12 that 78.9% of all employees surveyed are served with public water supplies, while 48.3% are served with private water supplies. This makes a total of 127.2%, indicating that quite a number of plants in Indiana have dual water supplies. Also plants having water-carried sewerage systems are potentially subject to the cross-connection hazard because of the danger of direct connections between water and sewer lines, leaks in sewers, back siphonage in improperly constructed or poorly installed plumbing fixtures and many other dangers.

It was impossible for the survey to include a cross-connection study due to the lack of time allotted, however the number of sanitation fixtures were listed and also whether or not the fixtures were of approved type construction. This was done in regard to drinking fountains, lavatories, flush toilets, pit privies, other types of toilet facilities (such as chemical closets, non-freezing toilets, etc.) and urinals. Results are presented in Table 11. Approval is based on the recommendations of the Bureau of Sanitary Engineering of the Indiana State Board of Health. Relatively few flush toilets were found to be of proper design. This was due to the fact that very few flushometer type toilets are provided with air breaks to prevent back siphonage of the contents of the bowl when stoppage occurs which raises the liquid level to a point above the inlet. Less danger is encountered in the reservoir and float type of toilet because, if back siphonage did occur, usually only the water in the reservoir would be drawn into the water supply and not the more dangerous water from the fixture bowl. The miscellaneous types of toilets listed as "other toilets" were also generally of improper construction or design, whereas over one-third of the pit privies were found to be of approved construction. The comparatively high percentage of approved pit privies is largely due to the efforts of the WPA Community Sanitation Project directed by the Bureau of Sanitary Engineering of the State Board of Health.

Only one-fifth of the drinking fountains were found to be approved due to the prevalence of the insanitary bubble fountain and the upturned faucet. Only fountains having guarded angle jets which discharge above the rim of the bowl were considered approved. A greater percent of lavatories were found to be approved. Lavatories are required to be provided with an adequate drain and with faucets or inlets at least one inch above the top of the bowl. Slightly less than half of the urinals were of approved type construction, the requirements for approval being practically the same as for lavatories with the addition that the inlet must be protected against splashing.

Table 12 presents other data regarding general sanitation for which little comment is required except that attention should be called to the prevalence of the common drinking cup and the common towel and the lack of the provision of hot water for washing.

TABLE 11—SANITATION FACILITIES (All Plants Surveyed)
NUMBER OF FACILITIES PROVIDED AND PERCENTAGE OF APPROVED TYPE

| Industry or Service Group | Number of plants | DRINKING | | | WASHING | | | Flush Toilets | | | Pit Privies | | | Other Type Toilets | | | Urinals | | |
|--|------------------------|-----------|---------------------|----------|------------|---------------------|----------|---------------|---------------------|----------|-------------|---------------------|----------|--------------------|---------------------|----------|---------|---------------------|----------|
| | | Fountains | | | Lavatories | | | Number | | | Number | | | Number | | | Number | | |
| | | Total | Percent approved | | Total | Percent approved | | Total | Percent approved | | Total | Percent approved | | Total | Percent approved | | Total | Percent approved | |
| | | | Number | Approved | | Number | Approved | | Number | Approved | | Number | Approved | | Number | Approved | | Number | Approved |
| ALL INDUSTRIES..... | 2,545 | 8,105 | 1,640 | 20.2 | 23,925 | 14,969 | 62.5 | 19,221 | 3,033 | 15.8 | 866 | 334 | 38.5 | 197 | 34 | 17.3 | 4,992 | 2,363 | 47.3 |
| Extraction of minerals..... | 74 | 16 | 0 | 0.0 | 25 | 9 | 36.0 | 25 | 0 | 0.0 | 63 | 27 | 42.8 | 0 | 0 | — | 4 | 2 | 50.0 |
| Manufacturing and mechanical..... | 2,309 | 7,908 | 1,617 | 20.4 | 23,535 | 14,872 | 63.1 | 18,720 | 3,002 | 16.0 | 802 | 307 | 38.3 | 197 | 34 | 17.3 | 4,977 | 2,359 | 47.4 |
| Chemical and allied..... | 107 | 508 | 115 | 22.6 | 2,408 | 1,059 | 44.0 | 1,272 | 283 | 22.2 | 40 | 7 | 17.5 | 1 | 1 | 100.0 | 326 | 168 | 51.5 |
| Cigar and tobacco..... | 10 | 78 | 0 | 0.0 | 317 | 15 | 4.7 | 91 | 0 | 0.0 | 0 | 0 | — | 0 | 0 | — | 0 | 0 | — |
| Clay, glass and stone..... | 169 | 447 | 59 | 13.2 | 1,023 | 646 | 63.1 | 901 | 54 | 6.0 | 187 | 73 | 39.0 | 2 | 1 | 50.0 | 249 | 125 | 50.2 |
| Clothing..... | 100 | 320 | 47 | 14.7 | 859 | 466 | 54.2 | 1,256 | 177 | 14.1 | 3 | 0 | 0.0 | 0 | 0 | — | 65 | 34 | 52.3 |
| Food and allied..... | 535 | 1,038 | 95 | 9.1 | 2,518 | 1,196 | 47.5 | 2,241 | 301 | 13.4 | 276 | 127 | 46.0 | 76 | 32 | 42.2 | 458 | 239 | 52.2 |
| Iron and steel machinery and vehicles..... | 480 | 2,814 | 778 | 27.6 | 10,046 | 8,143 | 80.8 | 6,635 | 1,200 | 18.1 | 168 | 64 | 38.1 | 63 | 0 | 0.0 | 2,566 | 1,353 | 52.7 |
| Metal industries except iron and steel..... | 143 | 387 | 88 | 22.7 | 1,336 | 735 | 55.1 | 1,028 | 192 | 18.7 | 4 | 1 | 25.0 | 0 | 0 | — | 295 | 94 | 31.9 |
| Leather..... | 21 | 59 | 1 | 1.7 | 111 | 28 | 25.2 | 149 | 17 | 11.4 | 1 | 0 | 0.0 | 0 | 0 | — | 20 | 7 | 35.0 |
| Lumber and furniture..... | 287 | 937 | 135 | 14.4 | 1,092 | 335 | 30.7 | 1,718 | 148 | 8.6 | 114 | 28 | 24.6 | 52 | 0 | 0.0 | 401 | 100 | 24.9 |
| Paper, printing and allied..... | 272 | 529 | 84 | 15.9 | 1,344 | 598 | 44.5 | 1,178 | 129 | 11.0 | 2 | 0 | 0.0 | 3 | 0 | 0.0 | 193 | 70 | 36.3 |
| Textile..... | 51 | 170 | 48 | 28.2 | 508 | 303 | 59.6 | 581 | 23 | 4.0 | 0 | 0 | — | 0 | 0 | — | 76 | 30 | 39.5 |
| Miscellaneous manufactur- ing..... | 134 | 621 | 167 | 26.9 | 1,973 | 1,348 | 68.3 | 1,670 | 478 | 28.6 | 7 | 7 | 100.0 | 0 | 0 | — | 328 | 139 | 42.4 |
| Personal service..... | 162 | 181 | 23 | 12.7 | 365 | 88 | 24.1 | 476 | 31 | 6.5 | 1 | 0 | 0.0 | 0 | 0 | — | 11 | 2 | 18.2 |

TABLE 12—GENERAL SANITATION (All Plants Surveyed)
PERCENT OF EMPLOYEES TO WHOM INDICATED SERVICE IS AVAILABLE

| INDUSTRY OR GROUP | Number of plants | DRINKING | | | | WASHING | | | | | | | |
|---|------------------|---------------------|---------------------|----------------------|------------------|-------------|------------|-----------|-------|--------------|-------------------|---------------------|---------------------|
| | | Number of employees | Public Water supply | Private Water supply | Indi-vidual cups | Common cups | Cold water | Hot water | Soap | Common towel | Indi-vidual towel | Separate lunch room | Indi-vidual lockers |
| ALL INDUSTRIES..... | 2,545 | 247,817 | 78.9 | 43.3 | 15.3 | 15.9 | 93.3 | 65.0 | 79.4 | 44.8 | 62.7 | 29.9 | 47.5 |
| Extraction of minerals..... | 74 | 4,704 | 10.3 | 94.1 | 5.4 | 65.0 | 94.9 | 88.6 | 7.6 | 93.0 | 0.9 | 1.5 | 56.4 |
| Manufacturing and mechanical..... | 2,309 | 238,183 | 79.9 | 48.0 | 15.7 | 15.0 | 93.1 | 64.5 | 80.4 | 44.1 | 64.7 | 31.0 | 47.9 |
| Chemical and allied..... | 107 | 15,741 | 87.8 | 56.8 | 50.2 | 33.7 | 99.8 | 97.2 | 97.6 | 64.9 | 81.3 | 68.4 | 95.2 |
| Cigar and tobacco..... | 10 | 1,035 | 100.0 | 0.0 | 1.9 | 91.2 | 100.0 | 87.2 | 100.0 | 10.1 | 86.0 | 67.0 | 19.1 |
| Clay, glass and stone..... | 169 | 15,343 | 70.4 | 65.4 | 19.1 | 26.3 | 90.0 | 99.9 | 61.2 | 94.2 | 61.1 | 25.8 | 48.7 |
| Clothing..... | 100 | 17,456 | 78.0 | 29.2 | 4.6 | 2.5 | 100.0 | 33.9 | 98.2 | 26.3 | 62.5 | 34.0 | 11.0 |
| Food and allied..... | 535 | 35,464 | 67.4 | 55.3 | 16.7 | 23.6 | 99.3 | 53.4 | 86.9 | 31.9 | 69.6 | 26.9 | 43.4 |
| Iron and steel machinery and vehicles..... | 480 | 80,728 | 80.9 | 54.1 | 17.7 | 10.6 | 84.5 | 78.0 | 69.1 | 61.3 | 68.6 | 28.5 | 96.0 |
| Metal industries except iron and steel..... | 143 | 9,474 | 92.8 | 47.0 | 14.5 | 5.2 | 100.0 | 69.1 | 73.4 | 96.7 | 66.8 | 31.3 | 47.5 |
| Leather..... | 21 | 2,056 | 96.5 | 42.1 | 9.0 | 26.9 | 99.7 | 62.9 | 89.0 | 13.1 | 82.9 | 2.3 | 1.4 |
| Lumber and furniture..... | 287 | 18,767 | 82.1 | 32.3 | 5.0 | 23.7 | 89.4 | 23.8 | 70.0 | 37.2 | 45.5 | 3.9 | 11.5 |
| Paper, printing and allied..... | 272 | 12,075 | 72.2 | 17.8 | 11.5 | 14.4 | 99.4 | 51.4 | 93.8 | 45.1 | 58.8 | 10.4 | 44.1 |
| Textile..... | 51 | 8,232 | 75.7 | 65.9 | 0.4 | 4.2 | 99.9 | 69.1 | 98.6 | 8.7 | 88.3 | 62.1 | 50.0 |
| Miscellaneous manufacturing..... | 134 | 21,822 | 94.7 | 36.8 | 8.4 | 2.1 | 99.9 | 78.4 | 94.8 | 18.3 | 83.2 | 44.8 | 58.8 |
| Personal service..... | 162 | 4,930 | 95.0 | 18.6 | 8.0 | 14.3 | 99.3 | 66.3 | 96.6 | 36.3 | 23.3 | 6.9 | 19.5 |

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EXPOSURES
TO SPECIFIED
MATERIALS
•

Potential Exposures to Specified Materials

In order to obtain full information concerning potential occupational exposures in each industrial group, it was necessary to list all raw materials and by-products encountered in each plant. The Field Engineers, in making the survey, listed all materials used or produced to a reasonable extent for each occupation in every plant surveyed whether the materials were thought to be harmful or not. Since there are over 500 materials which are known to be injurious under certain circumstances and since this number is increasing rapidly as new methods and products are introduced, it was necessary for the purpose of tabulation to combine many of the similar materials into one group. Materials were therefore coded into 51 of these major groups and each material was classified into one of the groups. Appendix A presents the major groups together with examples of the materials classified under each group. The various forms used in obtaining the data and in tabulating both by material, and by occupation and material are presented in Appendix B.

It should be pointed out that no quantitative tests were made to determine the *degree* of exposure that each worker had to any particular material. As a result it was thought best to tabulate only those materials which were considered as *potential* hazards to the workers.

Thus it is desired that the material exposures listed in the following tables and discussion be considered as potentially capable of producing an occupational disease.

The degree of toxicity of each material will vary with the quantity present, control measures used, and individual susceptibility of workers.

Tables 13 and 14 show the number and percent of workers respectively, in each industrial group surveyed that were exposed to the various groups of materials. The material group to which the largest number of workers were potentially exposed was metals. The classification of metals does not include such metals as arsenic, chromium, mercury, manganese, lead, antimony and selenium because these are the most toxic metals and were given separate classifications. The heading Metals (N.O.S.), includes all metals other than those indicated above and consists chiefly of iron, steel, zinc, copper, tin, brass and aluminum. Iron and steel dusts are prevalent in Indiana due to the large iron and steel industry in this State. As these dusts are much less toxic than such metals as lead, chromium and mercury, it does not follow that controlling the exposures to Metals (N.O.S.) is Indiana's largest industrial hygiene problem. Lead, which ranks eleventh in number of exposures is a far greater problem due to the high toxicity of this material and its wide spread use.

Dermatitis producers, second in number of exposures, creates another major problem. Many materials are included under this classification which may cause anywhere from a slight but disturbing irritation of the skin to ulcerative lesions, such as are seen by chrome ulcers.

High humidity and extreme temperature changes in themselves do not appear to be harmful to the workers. However, Bloomfield⁴ has shown that workers exposed to extreme temperature changes have a far greater pneumonia rate than other industrial workers. Even common colds may cause enough lost time among workers who are subject to a hot and cold environment or a moist environment to justify a serious effort to control these conditions to a point where they are no longer a problem.

Other important materials responsible for larger number of exposures are silica dust, lead, carbon monoxide, organic solvents, paints, and sulphur dioxide. While number of exposures is very important, it is still not a true picture. More pathology may occur among the 6,884 workers exposed to lead than in the 36,549 workers exposed to other metals, so that relative importance of the various materials should also be considered. As each industrial group is discussed a table will be shown of the material exposures as found in each industry in that group.

TABLE 13—NUMBER OF WORKERS EXPOSED TO SPECIFIC MATERIALS IN INDUSTRIAL OR SERVICE GROUP SURVEYED

| MATERIALS | Total all industries surveyed | Extraction minerals | Chemical and allied | Tobacco and cigar | Clay, glass and stone | Clothing and allied | Food and allied | Iron and steel | Metals other than iron and steel | Leather | Furniture and lumber | Paper and allied | Textiles | Miscellaneous Mfg. | Personal services |
|----------------------------------|-------------------------------|---------------------|---------------------|-------------------|-----------------------|---------------------|-----------------|----------------|----------------------------------|---------|----------------------|------------------|----------|--------------------|-------------------|
| Metals (N. O. S.).* | 36,549 | 164 | 1,185 | 4 | 1,230 | 58 | 399 | 26,886 | 2,959 | 7 | 372 | 397 | 44 | 2,886 | 8 |
| Dermatitis producers..... | 27,599 | 129 | 911 | 379 | 523 | 99 | 11,601 | 8,354 | 366 | 338 | 1,468 | 732 | 330 | 2,088 | 281 |
| Organic dusts..... | 22,948 | 27 | 843 | 190 | 355 | 2,548 | 2,164 | 3,025 | 454 | 215 | 6,448 | 255 | 3,751 | 2,152 | 21 |
| High humidity..... | 15,623 | 16 | 435 | 33 | 222 | 1,083 | 6,102 | 7,860 | 94 | 127 | 206 | 255 | 2,734 | 1,135 | 2,321 |
| Extreme temperature changes..... | 12,921 | 42 | 1,379 | ..... | 1,942 | 11 | 1,831 | 6,746 | 381 | 8 | 36 | 36 | 5 | 480 | 7 |
| Silica dust..... | 11,842 | 761 | 131 | ..... | 1,675 | 4 | 10 | 6,974 | 458 | 20 | 1,534 | 167 | 1 | 260 | 2 |
| Silicate dusts..... | 11,312 | 144 | 786 | 3 | 2,308 | 100 | 688 | 4,711 | 413 | 20 | 513 | 13 | 43 | 1,334 | 82 |
| Gases (N. O. S.)..... | 10,844 | 194 | 825 | ..... | 2,308 | 23 | 4,909 | 4,909 | 547 | 39 | 139 | 267 | 25 | 930 | 32 |
| Petroleum products..... | 10,067 | 179 | 901 | 22 | 1,344 | 133 | 5,013 | 433 | 327 | 23 | 281 | 327 | 523 | 649 | 40 |
| Non-siliceous dusts..... | 9,647 | 236 | 214 | 4 | 2,859 | 22 | 161 | 3,914 | 716 | 36 | 310 | 67 | 29 | 1,070 | 9 |
| Lead..... | 6,884 | 4 | 368 | ..... | 128 | 7 | 112 | 1,794 | 840 | 8 | 158 | 1,841 | 18 | 1,605 | 1 |
| Bituminous coal dust..... | 6,320 | 3,320 | 201 | ..... | 647 | 59 | 886 | 1,120 | 82 | 15 | 255 | 89 | 40 | 182 | 90 |
| Carbon monoxide..... | 6,364 | 383 | 383 | 3 | 477 | 67 | 1,028 | 3,165 | 233 | 17 | 266 | 109 | 48 | 295 | 111 |
| Organic solvents..... | 5,128 | 173 | 702 | 3 | 260 | 48 | 188 | 876 | 215 | 26 | 538 | 1,529 | 43 | 471 | 232 |
| Alkalis..... | 3,209 | 512 | 512 | ..... | 173 | 27 | 1,033 | 529 | 206 | 19 | 28 | 63 | 41 | 379 | 198 |
| Paints..... | 2,741 | 2 | 351 | ..... | 156 | 2 | 66 | 1,144 | 412 | 2 | 337 | 53 | 7 | 207 | 2 |
| Mineral acids..... | 2,381 | 314 | 223 | ..... | 13 | 9 | 118 | 993 | 325 | 5 | 46 | 58 | 25 | 442 | 8 |
| Oils (not petroleum)..... | 2,200 | 271 | 107 | ..... | 17 | ..... | 303 | 1,143 | 146 | 50 | 144 | 58 | 11 | 101 | 14 |
| Inks..... | 2,134 | 69 | 129 | 3 | 22 | 29 | 137 | 75 | 11 | 37 | 37 | 1,604 | 27 | 35 | 13 |
| Sulphur dioxide..... | 2,115 | ..... | 67 | ..... | 247 | 42 | 483 | 513 | 49 | 15 | 203 | 66 | 29 | 195 | 72 |
| Lacquers..... | 1,808 | ..... | 17 | ..... | 13 | ..... | 11 | 565 | 139 | 1 | 19 | 1,330 | 12 | 271 | 6 |
| Antimony..... | 1,506 | ..... | 202 | ..... | 3 | 1 | 10 | 44 | 64 | ..... | 3 | 116 | 16 | 17 | ..... |
| Chemicals (N. O. S.)..... | 1,494 | 2 | 579 | ..... | 95 | ..... | 180 | 267 | 57 | 7 | 3 | ..... | 26 | 156 | 13 |
| Infections..... | 1,248 | 1 | 202 | ..... | ..... | 16 | 795 | ..... | 4 | 30 | 352 | 91 | 230 | 170 | 2 |
| Dyes..... | 971 | ..... | 32 | ..... | 21 | 22 | 17 | 27 | ..... | 90 | 2 | 46 | 12 | 80 | 10 |
| Alcohols, esters and ethers..... | 901 | ..... | 209 | ..... | 10 | 10 | 224 | 97 | 100 | 12 | 57 | 19 | 12 | 19 | 3 |
| Salts (N. O. S.)..... | 650 | ..... | 212 | ..... | 57 | 3 | 161 | 143 | 4 | 1 | 7 | 11 | ..... | 172 | ..... |
| Coal tar products..... | 638 | ..... | 147 | ..... | 94 | ..... | 53 | 69 | 84 | ..... | 7 | ..... | ..... | 221 | ..... |
| Sulphur and compounds..... | 606 | ..... | 124 | ..... | 149 | 4 | 1 | 28 | 70 | ..... | 19 | 14 | ..... | 106 | 83 |
| Cyanides..... | 579 | ..... | 5 | ..... | ..... | ..... | 4 | 120 | 32 | ..... | 12 | 9 | 11 | 98 | ..... |
| Halogenated hydrocarbons..... | 452 | ..... | 82 | ..... | 8 | 4 | ..... | 189 | 93 | 2 | 3 | 1 | 5 | 15 | ..... |
| Chromium..... | 411 | ..... | 168 | 1 | ..... | 2 | 29 | 75 | 7 | 1 | ..... | ..... | ..... | 1 | ..... |
| Medicinals..... | 318 | ..... | 73 | ..... | 11 | ..... | 54 | 70 | 11 | 14 | ..... | 40 | 2 | 35 | 61 |
| Asbestos dust..... | 315 | ..... | 40 | ..... | 159 | 6 | 54 | 25 | 6 | ..... | 5 | ..... | ..... | 11 | 18 |
| Organic acids..... | 296 | ..... | 10 | ..... | 39 | 1 | 93 | 59 | 12 | 13 | 23 | 51 | ..... | 169 | ..... |
| Aldehydes..... | 232 | ..... | 18 | ..... | 17 | ..... | 15 | 15 | 62 | ..... | 2 | ..... | ..... | 33 | 8 |
| Benzene..... | 215 | ..... | 18 | ..... | 10 | ..... | 12 | 12 | 20 | ..... | 4 | 20 | 28 | 46 | ..... |
| Accelerators..... | 213 | ..... | 10 | ..... | 90 | 9 | 49 | 4 | 1 | 40 | 5 | ..... | ..... | 2 | ..... |
| Mercury..... | 154 | ..... | 8 | ..... | 7 | ..... | ..... | 38 | ..... | 27 | ..... | ..... | ..... | 6 | ..... |
| Aniline..... | 136 | ..... | 33 | ..... | 4 | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | 3 | ..... |
| Cadmium..... | 132 | ..... | 77 | ..... | 77 | ..... | ..... | ..... | 39 | ..... | ..... | ..... | ..... | 11 | ..... |
| Arsenic..... | 122 | ..... | 14 | ..... | 44 | ..... | ..... | ..... | 10 | ..... | ..... | ..... | ..... | 2 | ..... |
| Fluorides..... | 107 | ..... | 2 | ..... | 1 | ..... | ..... | 69 | 47 | ..... | ..... | ..... | ..... | 2 | ..... |
| Manganese..... | 77 | ..... | 5 | ..... | ..... | ..... | ..... | ..... | 3 | ..... | ..... | ..... | ..... | 2 | ..... |
| Chlorine..... | 77 | ..... | ..... | ..... | ..... | 9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2 | ..... |
| Selenium..... | 29 | ..... | 22 | ..... | 29 | ..... | ..... | ..... | ..... | ..... | 1 | ..... | 3 | ..... | 10 |
| Hydrogen sulphide..... | 26 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Anthrax coal dust..... | 11 | ..... | 6 | ..... | 9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Amines..... | 6 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Phosphorus..... | 2 | ..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Radium..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

*Includes metals other than arsenic, chromium, mercury, manganese, lead, antimony and selenium. It is chiefly iron, steel, zinc, copper and tin. (N. O. S.) Not otherwise specified.

TABLE 14—PERCENT OF WORKERS EXPOSED TO SPECIFIC MATERIALS IN INDUSTRIAL OR SERVICE GROUP SURVEYED

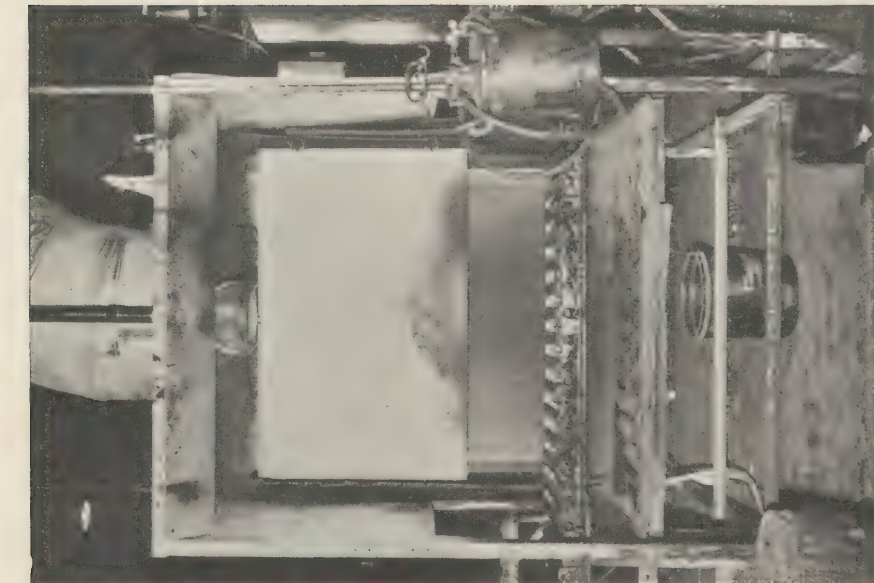
| MATERIALS | Total all industries surveyed | Extraction and minerals | Chemical and allied | Tobacco and cigar | Clay, glass and stone | Clothing and allied | Food and allied | Iron and steel | Metals other than iron and steel | Leather | Furniture and lumber | Paper and allied | Textiles | Miscellaneous Mfg. | Personal services |
|--|-------------------------------|-------------------------|---------------------|-------------------|-----------------------|---------------------|-----------------|----------------|----------------------------------|---------|----------------------|------------------|----------|--------------------|-------------------|
| TOTAL NUMBER ALL WORKERS SURVEYED..... | 247,817 | 4,704 | 15,741 | 1,035 | 15,343 | 17,456 | 35,464 | 80,728 | 9,474 | 2,056 | 18,757 | 12,075 | 8,232 | 21,822 | 4,930 |
| Metals (N. O. S.)†..... | 14.7 | 3.5 | 7.5 | 0.4 | 8.0 | 0.3 | 1.1 | 33.3 | 31.2 | 0.3 | 2.0 | 3.3 | 0.5 | 13.0 | 0.2 |
| Dermatitis producers..... | 11.1 | 2.7 | 5.8 | 36.6 | 3.4 | 0.6 | 32.7 | 10.3 | 3.9 | 16.4 | 7.8 | 6.1 | 4.0 | 9.6 | 5.7 |
| Organic dusts..... | 9.3 | 0.6 | 5.4 | 18.4 | 2.3 | 14.6 | 6.1 | 3.7 | 4.8 | 10.5 | 34.4 | 6.0 | 45.6 | 10.0 | 0.4 |
| High humidity..... | 6.3 | 0.3 | 2.8 | 3.2 | 1.4 | 6.2 | 17.2 | 1.1 | 1.0 | 6.2 | 1.1 | 2.1 | 33.2 | 5.2 | 47.1 |
| Extreme temperature changes..... | 5.2 | 0.9 | 8.8 | ..... | 12.7 | ..... | 5.2 | 8.4 | 4.0 | 0.4 | 0.3 | 0.3 | ..... | 2.2 | 0.1 |
| Silica dust..... | 4.8 | 16.2 | 0.8 | ..... | 10.9 | ..... | ..... | 8.6 | 4.8 | 1.0 | 8.2 | 0.1 | ..... | 1.2 | ..... |
| Silicate dusts..... | 4.6 | 4.1 | 5.0 | 0.3 | 15.0 | 0.6 | 1.9 | 5.8 | 4.4 | 1.0 | 2.7 | 1.4 | 0.5 | 6.1 | 1.7 |
| Gases (N. O. S.)..... | 4.4 | 3.8 | 5.2 | ..... | 8.8 | 0.1 | 4.4 | 6.1 | 5.8 | 1.9 | 0.8 | 2.2 | 0.3 | 4.3 | 0.6 |
| Petroleum products..... | 4.0 | 3.8 | 5.7 | 2.1 | 4.3 | 0.8 | 2.5 | 6.2 | 4.6 | 1.1 | 1.5 | 2.7 | 6.4 | 3.0 | 0.8 |
| Non-siliceous dusts..... | 3.9 | 5.0 | 1.4 | 0.4 | 18.6 | 0.1 | 0.5 | 4.8 | 7.6 | 1.8 | 1.7 | 0.6 | 0.4 | 4.9 | 0.2 |
| Lead..... | 2.8 | ..... | 2.3 | ..... | 0.8 | ..... | 0.3 | 2.2 | 8.9 | 0.4 | 0.8 | 15.2 | 0.2 | 7.4 | ..... |
| Bituminous coal dust..... | 2.7 | 70.6 | 1.3 | 0.3 | 4.2 | 0.3 | 1.9 | 1.4 | 0.9 | 0.7 | 1.4 | 0.7 | 0.5 | 0.8 | 1.8 |
| Carbon products..... | 2.4 | 3.7 | 2.4 | 0.3 | 3.1 | 0.4 | 3.0 | 3.9 | 2.5 | 0.8 | 1.4 | 0.9 | 0.6 | 1.4 | 2.3 |
| Organic solvents..... | 2.0 | ..... | 4.5 | ..... | 1.7 | 0.3 | 0.5 | 1.1 | 2.3 | 1.3 | 2.9 | 1.2 | 0.5 | 2.2 | 4.7 |
| Alkalis..... | 1.3 | ..... | 3.3 | ..... | 1.1 | 0.2 | 2.9 | 0.7 | 2.2 | 0.9 | 0.1 | 0.5 | 0.5 | 1.7 | 4.0 |
| Paints..... | 1.1 | ..... | 2.2 | ..... | 1.0 | ..... | 0.2 | 1.4 | 4.3 | ..... | 1.8 | 0.4 | ..... | 0.9 | ..... |
| Mineral acids..... | 1.0 | ..... | 2.0 | ..... | 0.1 | ..... | 0.3 | 1.2 | 3.4 | 0.2 | 0.2 | 0.7 | 0.3 | 2.0 | 0.2 |
| Oils (not petroleum)..... | 0.9 | ..... | 1.4 | ..... | 0.1 | ..... | 0.9 | 1.4 | 1.5 | 2.4 | 0.8 | 0.5 | 0.1 | 0.5 | ..... |
| Inks..... | 0.9 | ..... | 0.7 | 0.3 | 0.1 | 0.2 | 0.4 | ..... | 0.1 | 1.8 | 0.2 | 1.3 | 0.3 | 0.2 | 0.3 |
| Sulphur dioxide..... | 0.9 | 1.5 | 0.8 | ..... | 1.6 | 0.2 | 1.4 | 0.6 | 0.5 | 0.7 | 1.1 | 0.5 | 0.4 | 0.9 | 1.5 |
| Lacquers..... | 0.7 | ..... | 0.4 | ..... | ..... | ..... | ..... | 0.7 | 1.5 | ..... | 3.7 | 0.3 | 0.1 | 1.2 | 0.1 |
| Antimony..... | 0.6 | ..... | 0.1 | ..... | ..... | ..... | ..... | 0.3 | 0.6 | 0.3 | 0.1 | 1.0 | 0.2 | 0.7 | 0.3 |
| Chemicals (N. O. S.)..... | 0.6 | ..... | 3.7 | ..... | 0.6 | ..... | 2.2 | ..... | ..... | 1.5 | ..... | ..... | 0.3 | 0.8 | ..... |
| Infections..... | 0.5 | ..... | 1.3 | ..... | 0.1 | 0.1 | ..... | ..... | 1.1 | 4.4 | 1.9 | 0.8 | 2.8 | 0.4 | 0.2 |
| Dyes..... | 0.4 | ..... | 0.2 | ..... | ..... | ..... | 0.6 | 0.1 | ..... | ..... | 0.3 | 0.4 | ..... | 0.4 | 1.3 |
| Alcohols, esters and others..... | 0.4 | ..... | 1.3 | ..... | 0.4 | ..... | 0.5 | 0.2 | 0.9 | 0.6 | ..... | 0.2 | 0.1 | ..... | ..... |
| Salts (N. O. S.)..... | 0.3 | ..... | 1.3 | ..... | 0.6 | ..... | 0.1 | ..... | 0.7 | ..... | ..... | ..... | ..... | ..... | ..... |
| Coal tar products..... | 0.3 | ..... | 0.9 | ..... | ..... | ..... | ..... | ..... | 0.9 | ..... | ..... | ..... | ..... | ..... | ..... |
| Sulphur and compounds..... | 0.2 | ..... | 0.8 | ..... | 1.0 | ..... | ..... | 0.3 | 1.4 | ..... | 0.1 | 0.1 | 0.1 | 0.8 | 0.1 |
| Cyanides..... | 0.2 | ..... | ..... | ..... | ..... | ..... | ..... | 0.1 | 0.3 | ..... | ..... | ..... | ..... | 0.6 | ..... |
| Halogenated hydrocarbons..... | 0.2 | ..... | 0.5 | ..... | ..... | ..... | ..... | 0.2 | 1.0 | ..... | ..... | ..... | ..... | 0.4 | ..... |
| Chromium..... | 0.2 | ..... | 0.1 | ..... | ..... | ..... | ..... | 0.1 | 0.3 | ..... | ..... | ..... | ..... | ..... | ..... |
| Medicinals..... | 0.1 | ..... | 1.1 | ..... | ..... | ..... | ..... | ..... | 0.1 | ..... | ..... | ..... | ..... | ..... | ..... |
| Asbestos dust..... | 0.1 | ..... | 0.5 | ..... | 1.0 | ..... | ..... | ..... | 0.1 | 0.7 | ..... | 0.4 | ..... | 0.2 | 1.2 |
| Organic acids..... | 0.1 | ..... | 0.3 | ..... | 0.3 | ..... | 0.2 | ..... | 0.1 | ..... | ..... | 0.1 | ..... | ..... | ..... |
| Aldehydes..... | 0.1 | ..... | 0.1 | ..... | 0.1 | ..... | 0.3 | ..... | 0.1 | ..... | 0.1 | 0.4 | ..... | 0.8 | 0.4 |
| Benzene..... | ..... | ..... | 0.1 | ..... | ..... | ..... | ..... | ..... | 0.2 | ..... | ..... | ..... | ..... | 0.2 | 0.2 |
| Accelerators..... | ..... | ..... | ..... | ..... | ..... | 0.5 | ..... | ..... | ..... | 1.9 | ..... | 0.2 | 0.3 | 0.2 | ..... |
| Mercury..... | ..... | ..... | 0.1 | ..... | ..... | ..... | ..... | ..... | 0.2 | 1.3 | ..... | ..... | ..... | 0.2 | ..... |
| Antine..... | ..... | ..... | 0.1 | ..... | ..... | ..... | ..... | ..... | 0.4 | ..... | ..... | ..... | ..... | ..... | ..... |
| Cadmium..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 0.1 | ..... | ..... | ..... | ..... | ..... | ..... |
| Arsenic..... | ..... | ..... | 0.2 | ..... | 0.5 | ..... | 0.1 | ..... | 0.1 | ..... | ..... | ..... | ..... | ..... | ..... |
| Fluorides..... | ..... | ..... | 0.1 | ..... | 0.3 | ..... | ..... | ..... | 0.5 | ..... | ..... | ..... | ..... | ..... | ..... |
| Manganese..... | ..... | ..... | ..... | ..... | ..... | ..... | 0.1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Chlorine..... | ..... | ..... | ..... | ..... | 0.2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 0.2 |
| Selenium..... | ..... | ..... | 0.1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Hydrogen sulphide..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Anthracite coal dust..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Ammonia..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Phosphorus..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Radium..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

†This includes metals other than arsenic, chromium, cadmium, mercury, manganese, lead, antimony and selenium. It is chiefly iron, steel, zinc, copper and tin.

*Less than 0.1%.

(N. O. S.) Not otherwise specified.

•
CONTROL
MEASURES
•



Spray Painting Booth—an example of enclosure and local exhaust as control measures. Note large exhaust duct.



Sandblasting Cabinet an example of enclosure. Parts are placed in cabinet and through gauntlet openings, operator handles and blasts the pieces.

Control Measures

There are any number of satisfactory methods of controlling the hazards due to material exposures depending upon the type of material and the method in which it is used. In selecting a means of controlling any exposure, it is necessary to know the nature of the material, its safe threshold, and type of pathology it may produce in toxic concentrations.

The general methods of control will be presented with the understanding that, while one method may be entirely satisfactory for one material, this same method may be valueless as the control of another material. The principal control methods are:

1. Substitution of a non-toxic material for a toxic one.
2. Isolation of the hazardous occupation from the other occupations.
3. Prevent the dispersion of dusts, fumes, gases, etc., by:
 - a. Applying local exhaust at the point of origin.
 - b. Enclosing the operation or process.
 - c. Using wet methods at the point of origin.
 - d. Installing either positive or negative general ventilation, or both.
4. Require the wearing of personal protective devices, such as:
 - a. Respirators.
 - b. Air line respirators or pressure helmets.
 - c. Gas masks.
 - d. Protective clothing, such as gloves, aprons, boots, head and body coverings.
 - e. Protective creams, salves or ointments.
5. Other protective or preventive devices such as chairs, salt tablets and adequate lighting.

The above methods are not all inclusive but present a general picture of the methods used in practice. One method may be sufficient or it may require several to control the exposure adequately. The controls are listed in order of importance, it being much more important to eliminate the hazard by substituting a harmless product than by trying to control the hazard once it is present by prevention of dispersion or applying protective devices. Respirators and gas masks should be the last resort and should not be considered unless more desirable methods can not be used.

Not all of the above controls were listed as such in the survey; however, the more important controls provided by industry in each work room and for each occupation were tabulated. No information was secured on the adequacy of any control. Some of the controls provided were crude makeshifts while others were well designed and properly installed. Even if a worker was provided with the correct control, he may not have been properly safeguarded because of improper application or poor maintenance of that control. The tables showing the controls provided by Indiana industries, therefore, indicate only that industry has provided that particular type of control and no attempt was made at this time to measure its adequacy.

Table 15 presents a summary of controls provided in all industrial groups surveyed. It is admitted that this table does not mean as much as the individual tables for each industry; however, this table was prepared for comparison with other states which only provided a single table of controls. As would be expected, extremely toxic materials have a higher percentage of controls than relatively less toxic materials. Materials such as silica dust (44.5% of exposed workers had controls), lead (31.8%), organic solvents (30.6%), alkalis (32.3%), paints (53.0%), mineral acids (51.7%), cyanides (70.6%), halogenated hydrocarbons (41.6%), chromium (73.5%), benzene (47.4%), accelerators (80.8%), mercury (65.6%), cadmium (76.5%), selenium (100%) and amines (100%) headed the list. It will also be noted that many of the workers provided with controls had more than one control for that particular exposure. The prevalence of negative general ventilation and local exhaust is distinctly noticeable.

In obtaining data on respirators the field engineers noted whether or not each respirator was the proper type for the particular material exposure. The United States Bureau of Mines maintains a testing laboratory for respirators and has typed the various materials which each respirator will handle satisfactorily in certain concentrations. The types listed are:

1. Type A—Pneumoconiosis producing or nuisance dusts (protection against quartz, asbestos, iron ores, cement, limestone, gypsum, coal, coke, charcoal, wood, cellulose, flour and aluminum).
2. Lead Dust (protection against mechanically generated lead dust).
3. Type A and Lead Dust (protection against a combination of Type A and Lead Dust).
4. Type B—Fumes (protection against fumes of metals such as lead, mercury, manganese, magnesium, aluminum, antimony, arsenic, etc.).
5. Type C—Mists (protection against the mist of chromic acid, spray painting mists with lead paints, and spray painting mists with vitreous enamels).

Each respirator approved under one of the above types has a Bureau of Mines approval number and these numbers were noted by the engineers and checked against the approval sheet. In this way it was possible to classify respirators into approved and non-approved types for each material. It will be noted that many respirators were provided for certain materials and were not intended for those materials, such as a lead dust respirator being used for lead fumes. Also quite a few respirators were provided for harmful vapors and gases for which no approved respirator to date has been developed. More information, however, can be obtained from the tables under each industrial group than from the master table.

Material Exposure by Occupation

It was also desirable to determine just where each worker that was exposed to injurious materials could be located in order that future studies could be made to determine the degree of exposure, the effectiveness of the controls, if any, and the desirable corrections to be made to make his occupation less hazardous. Also in the event that a study involving medical, engineering and laboratory services would be desired, it would be relatively simple to find out just where the hazardous occupations in each industry would be. This information has been obtained in about a dozen

TABLE 15.—PERCENT OF EXPOSED WORKERS HAVING CONTROLS IN ALL INDUSTRIAL AND SERVICE GROUPS SURVEYED

2,545 Plants; 247,817 Employees

| MATERIAL | Number of workers exposed | PERCENT OF EXPOSED WORKERS HAVING INDICATED TYPE OF CONTROL | | | | | | | | | | Percent of Exposed workers having one or more controls |
|----------------------------------|---------------------------|---|----------|---------------|------------------|------------|----------|---------------|--------------|---------------------|---------------------|--|
| | | General ventilation | | Local exhaust | Enclosed Process | Wet Method | Gas mask | Respirator | | Air Line respirator | Protective clothing | Other |
| | | Positive | Negative | | | | | Approved type | Not approved | | | |
| Metals (N. O. S.)..... | 36,549 | 1.8 | 5.4 | 14.8 | 1.5 | 16.0 | | 1.5 | 1.8 | 0.4 | 0.5 | * |
| Dermatitis producers..... | 27,599 | 1.8 | 9.3 | 26.7 | 2.4 | 1.0 | | 0.7 | 1.5 | * | 3.5 | 0.1 |
| Organic dusts..... | 22,948 | 2.6 | 14.4 | 4.5 | 1.0 | | | | | | 0.4 | 0.4 |
| High humidity..... | 15,625 | 4.2 | 5.9 | 4.8 | 0.3 | | | | | | 3.2 | 7.7 |
| Extreme temperature changes..... | 12,921 | 4.7 | 6.2 | 19.2 | 3.9 | 8.2 | | 6.9 | 4.4 | 0.8 | * | 0.2 |
| Silica dust..... | 11,842 | 3.7 | 3.9 | 19.9 | 1.3 | 10.5 | | 4.5 | 1.6 | | | 0.3 |
| Silicate dusts..... | 11,312 | 3.7 | 3.8 | 13.4 | 3.8 | | | * | 1.4 | | | |
| Gases (N. O. S.)..... | 10,844 | 3.7 | 3.8 | 13.4 | 2.0 | | | 1.5 | | | | |
| Petroleum products..... | 10,067 | 2.1 | 1.4 | 1.8 | 4.9 | 0.2 | | | | | 0.6 | 6.6 |
| Non-siliceous dusts..... | 9,647 | 2.1 | 5.0 | 22.5 | 2.0 | 14.1 | | 3.9 | 3.5 | * | 0.4 | 48.0 |
| Lead..... | 6,884 | 1.6 | 11.2 | 17.7 | 4.1 | 2.1 | | 3.0 | 2.4 | 0.6 | 1.0 | 14.4 |
| Bituminous coal dust..... | 6,800 | 38.5 | 0.5 | 1.2 | 1.2 | 1.3 | | 2.6 | 1.1 | | | 12.7 |
| Carbon monoxide..... | 6,364 | 1.9 | 2.8 | 6.9 | 2.3 | | 0.1 | | 0.6 | | | 0.1 |
| Organic solvents..... | 5,128 | 2.9 | 10.2 | 13.8 | 5.5 | * | | 1.7 | 3.4 | * | 0.7 | 30.6 |
| Alkalis..... | 3,209 | 1.8 | 10.7 | 13.3 | 0.4 | * | | 0.8 | 2.4 | 0.3 | 8.1 | 1.7 |
| Paints..... | 2,741 | 5.4 | 7.2 | 38.2 | 1.2 | * | 0.1 | 6.1 | 12.7 | | 16.6 | 3.1 |
| Mineral acids..... | 2,381 | 2.3 | 16.3 | 23.9 | 5.5 | * | 0.3 | * | 1.2 | * | | 51.7 |
| Oils (not petroleum)..... | 2,200 | 0.7 | 2.7 | 5.6 | 1.0 | | | | 0.4 | | 0.7 | 9.7 |
| Inks..... | 2,134 | 3.8 | | 3.4 | | | | | | | | 11.2 |
| Sulphur dioxide..... | 2,115 | | 1.8 | 2.5 | 4.3 | | 0.2 | | 0.5 | | | 8.9 |
| Lacquers..... | 1,808 | 0.4 | 3.8 | 52.8 | 5.1 | | | 3.3 | 14.2 | 0.3 | 0.6 | 60.9 |
| Antimony..... | 1,506 | 1.8 | 23.7 | 25.3 | 5.6 | * | | | 0.6 | | | 42.9 |
| Chemicals (N. O. S.)..... | 1,494 | 4.2 | 7.8 | 2.5 | 0.5 | | | 0.5 | 0.3 | | * | 12.4 |
| Infections..... | 1,248 | | 0.4 | 0.4 | | | | | | | | 3.3 |
| Dyes..... | 971 | 5.7 | 5.3 | 18.8 | 1.1 | | | 0.4 | 2.9 | | 2.9 | 25.1 |
| Alcohols, esters and ethers..... | 901 | 0.9 | 23.5 | 12.1 | 5.1 | | 0.1 | | 1.5 | | 1.2 | 0.3 |
| Salts (N. O. S.)..... | 650 | 0.9 | 1.5 | 8.2 | 0.8 | | | | 3.8 | | 1.1 | 3.2 |
| Coal tar products..... | 638 | 0.2 | 10.0 | 27.9 | 0.5 | | | 1.7 | 0.2 | | 1.8 | 20.5 |
| Sulphur and compounds..... | 606 | 1.7 | 21.3 | 23.9 | 2.8 | 0.3 | | 5.1 | 10.2 | | 0.8 | 4.5 |
| Cyanides..... | 579 | 4.3 | 31.4 | 59.6 | 12.1 | 0.5 | 1.0 | | 5.0 | | 5.3 | 48.3 |
| Halogenated hydrocarbons..... | 452 | 3.5 | 12.8 | 21.9 | 6.6 | | 0.9 | | 3.6 | 0.7 | 1.6 | 70.6 |
| Chromium..... | 411 | | 9.7 | 68.1 | | 0.5 | | 0.5 | 1.2 | | 4.1 | 4.4 |
| Medicinals..... | 318 | | 6.3 | 17.0 | 3.8 | | | | 12.9 | | 0.9 | |
| Asbestos dust..... | 315 | | 19.7 | 19.7 | 8.3 | | 0.6 | 0.3 | 2.5 | | 3.0 | 37.1 |
| Organic acids..... | 296 | 0.7 | 23.0 | 15.9 | 2.0 | | | | 6.4 | | | 39.5 |
| Aldehydes..... | 232 | | 6.9 | 16.8 | 6.9 | | | | 4.3 | | 2.8 | 27.6 |
| Benzene..... | 215 | 2.8 | 31.2 | 10.2 | 3.3 | | | | 7.5 | | | 47.4 |
| Accelerators..... | 213 | 4.7 | 42.3 | 61.0 | | 1.9 | | | | | | 80.8 |
| Mercury..... | 154 | 4.4 | 60.4 | 3.9 | 2.6 | | | | | | 5.2 | 65.6 |
| Aniline..... | 136 | | 8.1 | 6.6 | | | | | | | | 19.1 |
| Cadmium..... | 132 | | 18.9 | 68.2 | 0.8 | | | | 2.9 | | 2.9 | 11.4 |
| Arsenic..... | 122 | 3.3 | 1.6 | 32.0 | 13.9 | 2.5 | | | 55.7 | | 9.0 | 76.5 |
| Fluorides..... | 107 | 6.5 | 8.4 | 16.8 | 1.9 | | | | 27.3 | | 25.2 | 44.9 |
| Manganese..... | 77 | 2.6 | 3.9 | 24.7 | | | | | 1.3 | | | 51.9 |
| Chlorine..... | 77 | 3.9 | 20.8 | 28.6 | 7.8 | | 7.8 | | 100.0 | | | 58.4 |
| Selenium..... | 29 | | | 48.3 | | | | | | | | 100.0 |
| Hydrogen sulphide..... | 26 | | | | | | | | | | | 38.5 |
| Anthracite coal dust..... | 11 | | | | | | | | | | | 100.0 |
| Amines..... | 6 | | | | | | | | | | | |
| Phosphorus..... | 2 | | | | | | | | | | | |
| Radium..... | | | 100.0 | | | | | | | | | |

*Less than 0.1%
(N. O. S.) Not otherwise specified.

different industries merely to present the more important materials and the occupations where these materials were encountered. Similar information is available for the remaining industries, but is not presented in this report in order to save space.

The material exposure by occupation tables will be found in the particular discussion relating to the industrial group being considered. The occupational analysis for the Paint and Varnish Industry is presented along with the other data pertaining to the Chemical and Allied industrial groups and so on. Occupations were very general in nature and many similar occupations were combined in order to prevent the table from becoming too long. The number of workers in each occupation which were found to have exposures to each material was listed. A few of the material exposures for some occupations may appear to be out of line, but in those cases the workers probably had two or three jobs and as a result had more exposures than the majority in that occupation.

Occupational tables were not made up on these industries for which other states had already completed similar tables. The State of New Hampshire notably has covered certain industries very well and it was felt that new industries should be selected for the Indiana report rather than a duplication of this work. Each table dealing with occupational exposures will be discussed as it is presented.

•
EXTRACTION
OF
MINERALS
•



Placing sand into the sandbox of haulage tractor in a coal mine. The sand is applied on rails for stops and is continually ground and reground, thereby increasing the silica content of haulage ways.



Machine used to cut coal in mines prior to blasting.

EXTRACTION OF MINERALS

The number of workers exposed to various materials in the extraction of minerals classification is shown in Table 16. For this industry three sub-divisions are presented: coal mines, sand and gravel pits, and limestone quarries. If the limestone was also fabricated as well as extracted, that plant was not classified under this heading, but under manufacturing and mechanical; sub-group lime and artificial stone. This will explain why so few persons are listed in the limestone quarry industry. In these industries approximately 10 major exposures were found of a total of 51.

The coal mines contributed to the greater number of workers, as well as exposures to bituminous coal dust, which was the leading material exposure for this group. Silica dust was next in numerical importance. The coal mines, through "the technique of sanding the rails" in the haulage ways contributed heavily to this exposure. (See photograph on fly leaf.) The balance was in the sand and gravel pit industry. Non-siliceous dust, chiefly limestone in this instance, was next. Limestone is practically pure calcium carbonate and was therefore classified as a non-siliceous, and consequently non-silicosis producing dust. Again, it should be pointed out that these figures are merely based on tabulations of potential exposures and no quantitative evaluations were made.

Since industrial establishments have been classified according to their chief product, all the operations in an industry will not be common to that industry alone. This factor must be taken into consideration with respect to the mining industry. The survey of coal mines, for example, also include outside activities as machine shops, offices, repair men, etc. No attempt was made to sub-divide these industries into departmental divisions for any of these reports, since we were mainly concerned with exposures for the industry as a whole.

TABLE 16—EXTRACTION OF MINERALS

| MATERIAL | NUMBER AND PERCENT OF WORKERS IN EACH SUB GROUP EXPOSED TO SPECIFIED MATERIAL | | | | | | | |
|------------------------------------|---|-------|------------|------|-----------------|-------|---------------------------------|-------|
| | Total | | Coal Mines | | Sand and Gravel | | Limestone Quarries ¹ | |
| | No. | % | No. | % | No. | % | No. | % |
| TOTAL NUMBER WORKERS EMPLOYED..... | 4,704 | ..... | 4,125 | 87.7 | 371 | 7.9 | 208 | 4.4 |
| Bituminous coal dust..... | 3,320 | 70.6 | 3,269 | 79.2 | 27 | 7.3 | 24 | 11.5 |
| Silica dust..... | 761 | 16.2 | 705 | 17.1 | 56 | 15.1 | ..... | ..... |
| Non-siliceous dusts..... | 236 | 5.0 | 45 | 1.1 | 88 | 23.7 | 103 | 49.5 |
| Gases (N. O. S.)..... | 194 | 4.1 | 168 | 4.1 | 2 | 0.5 | 24 | 11.5 |
| Petroleum products..... | 179 | 3.8 | 119 | 2.9 | 54 | 14.6 | 6 | 2.9 |
| Carbon monoxide..... | 173 | 3.7 | 130 | 3.2 | 12 | 3.2 | 31 | 14.9 |
| Metals (N. O. S.)..... | 164 | 3.5 | 154 | 3.0 | 6 | 1.6 | 4 | 1.9 |
| Silicate dusts..... | 144 | 3.1 | 117 | 2.8 | 8 | 2.2 | 19 | 9.1 |
| Dermatitis producers..... | 129 | 2.7 | 124 | 3.0 | 3 | 0.8 | 2 | 1.0 |
| Sulphur dioxide..... | 69 | 1.5 | 52 | 1.3 | 5 | 1.3 | 12 | 5.8 |
| Extreme temperature changes..... | 42 | 0.9 | 17 | 0.4 | ..... | ..... | 25 | 12.0 |
| Organic dusts..... | 27 | 0.6 | 16 | 0.4 | 3 | 0.8 | 8 | 3.8 |
| High humidity..... | 16 | 0.3 | 16 | 0.4 | ..... | ..... | ..... | ..... |
| Lead..... | 4 | * | 4 | 0.1 | ..... | ..... | ..... | ..... |
| Paints..... | 2 | * | 2 | * | ..... | ..... | ..... | ..... |
| Chemicals (N. O. S.)..... | 2 | * | 2 | * | ..... | ..... | ..... | ..... |
| Infections..... | 1 | * | 1 | * | ..... | ..... | ..... | ..... |
| Alkalis..... | 1 | * | 1 | * | ..... | ..... | ..... | ..... |

*Less than 0.1%

¹Only Quarrying—if engaged in finishing, then the industry is classified under Clay, glass and stone.

(N. O. S.) Not otherwise specified.

Control Measures Used: Table 17 illustrates the engineering control measures used by the industry to prevent the occurrence of occupational diseases; positive general ventilation was used practically to the exclusion of all others. This is due to the fact that Indiana laws compel mine operators to use positive ventilation in the mines. The wet methods used in the control of non-siliceous dusts were chiefly in the sand and gravel industry. Local exhausts were used for 0.8% of exposures of non-siliceous dusts.

TABLE 17—EXTRACTION OF MINERALS INDUSTRY—CONTROLS
74 Plants—4,704 Employees

| MATERIAL | Number of workers exposed | PERCENT OF EXPOSED WORKERS HAVING INDICATED TYPE OF CONTROL | | | | | | | | | | Percent of exposed workers having one or more controls | |
|----------------------------------|---------------------------|---|----------|---------------|------------------|------------|----------|---------------|--------------|---------------------|---------------------|--|-------|
| | | General ventilation | | Local exhaust | Enclosed process | Wet method | Gas mask | Respirator | | Air line respirator | Protective clothing | | Other |
| | | Positive | Negative | | | | | Approved type | Not approved | | | | |
| Bituminous coal dust..... | 3,320 | 78.5 | 0.3 | ..... | ..... | 2.6 | ..... | 1.2 | 0.1 | ..... | ..... | ..... | 79.5 |
| Silica dust..... | 761 | 65.8 | 0.4 | ..... | ..... | 1.8 | ..... | ..... | 2.9 | ..... | ..... | ..... | 68.3 |
| Non-siliceous dusts..... | 236 | 23.8 | ..... | ..... | ..... | 13.6 | ..... | ..... | ..... | ..... | ..... | ..... | 40.3 |
| Gases (N. O. S.)..... | 194 | 30.9 | ..... | 0.8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 31.4 |
| Petroleum products..... | 179 | 1.1 | ..... | 0.5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2.2 |
| Carbon monoxide..... | 173 | 35.3 | ..... | 1.1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 35.3 |
| Metals (N. O. S.)..... | 164 | 35.4 | ..... | ..... | 0.6 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 36.0 |
| Silicate dusts..... | 144 | 20.1 | ..... | ..... | ..... | 2.1 | ..... | ..... | 1.4 | ..... | ..... | ..... | 23.6 |
| Dermatitis producers..... | 129 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Sulphur dioxide..... | 69 | 2.9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2.9 |
| Extreme temperature changes..... | 42 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 11.9 | ..... | 11.9 |
| Organic dust..... | 27 | 22.2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 22.2 |
| High humidity..... | 16 | 62.5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 62.5 |
| Lead..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Paints..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Chemicals (N. O. S.)..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Infections..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Alkalis..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

(N. O. S.) Not otherwise specified.

•
CHEMICAL
AND ALLIED
•

TABLE 18—CHEMICAL AND ALLIED INDUSTRIES

| MATERIAL | NUMBER AND PERCENT OF WORKERS IN EACH SUB GROUP EXPOSED TO SPECIFIED MATERIALS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------------|--|-----|-----------------|------|------------|------|-----------|------|--------------------|------|----------------------|------|-------|------|------------------------|------|----------------|------|------------------|------|-------|------|-------|------|---------|------|---------------|------|-----------|------|----------------------|------|
| | Total | | Explosives etc. | | Fertilizer | | Gas works | | Paints and varnish | | Petroleum refineries | | Soap | | Blacking, stains, etc. | | Chemical works | | Compressed gases | | Drugs | | Glues | | Greases | | Oils not Pet. | | Cosmetics | | Chemicals (N. O. S.) | |
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| TOTAL NO. WORKERS EMPLOYED.. | 15,741 | | 84 | 0.5 | 267 | 1.7 | 166 | 1.1 | 678 | 4.3 | 7,659 | 48.6 | 1,584 | 10.1 | 351 | 2.2 | 1,156 | 7.3 | 150 | 1.0 | 2,527 | 16.1 | 47 | 0.3 | 133 | 0.8 | 46 | 0.3 | 77 | 0.5 | 816 | 5.2 |
| Extreme temperature changes.... | 1,379 | 8.8 | 2 | 2.4 | | | 37 | 22.3 | 12 | 1.8 | 1,170 | 15.3 | 28 | 1.8 | 5 | 1.4 | 76 | 6.6 | | | 19 | 0.8 | | | 12 | 9.0 | | | | | 18 | 2.2 |
| Metals (N. O. S.)..... | 1,185 | 7.5 | 3 | 3.6 | 1 | 0.4 | 9 | 5.4 | 83 | 12.2 | 782 | 10.2 | 70 | 4.4 | 18 | 5.1 | 92 | 8.0 | | | 72 | 2.8 | 5 | 10.6 | 1 | 0.8 | 5 | 10.9 | 8 | 10.4 | 36 | 4.4 |
| Dermatitis producers..... | 911 | 5.8 | 8 | 9.5 | 5 | 1.9 | 9 | 5.4 | 23 | 3.4 | 314 | 4.1 | 50 | 3.2 | 112 | 31.9 | 24 | 2.1 | | | 199 | 7.9 | 8 | 17.0 | 20 | 15.0 | 1 | 2.2 | 12 | 15.6 | 126 | 15.4 |
| Petroleum products..... | 901 | 5.7 | 9 | 10.7 | 2 | 0.8 | 14 | 8.4 | 29 | 4.3 | 596 | 7.8 | 56 | 3.5 | 38 | 10.8 | 48 | 4.2 | | | 51 | 2.0 | 1 | 2.1 | 5 | 3.8 | | | 3 | 3.9 | 49 | 6.0 |
| Organic dusts..... | 843 | 5.4 | 15 | 17.9 | 139 | 52.1 | | | 48 | 7.1 | 122 | 1.6 | 185 | 11.7 | 25 | 7.1 | 44 | 3.8 | | | 72 | 2.8 | 6 | 12.8 | 23 | 17.3 | 1 | 2.2 | 2 | 2.6 | 161 | 19.7 |
| Gases (N. O. S.)..... | 825 | 5.2 | | | 24 | 9.0 | 47 | 28.3 | 13 | 1.9 | 465 | 6.1 | 19 | 1.2 | 6 | 1.7 | 123 | 10.6 | 42 | 28.0 | 53 | 2.1 | | | 3 | 2.3 | | | | | 30 | 3.7 |
| Silicate dusts..... | 786 | 5.0 | 2 | 2.4 | 1 | 0.4 | 19 | 11.4 | 19 | 2.8 | 494 | 6.4 | 49 | 3.1 | 4 | 1.1 | 61 | 5.3 | 5 | 3.3 | 64 | 2.5 | 1 | 2.1 | 7 | 5.3 | 1 | 2.2 | 9 | 11.7 | 50 | 6.1 |
| Organic solvents..... | 702 | 4.5 | 1 | 1.2 | 1 | 0.4 | 4 | 2.4 | 134 | 19.8 | 386 | 5.0 | 7 | 0.4 | 85 | 24.2 | 4 | 0.3 | 8 | 5.3 | 48 | 1.9 | 3 | 6.4 | 2 | 1.5 | 4 | 8.7 | 2 | 2.6 | 13 | 1.6 |
| Chemicals (N. O. S.)..... | 579 | 3.7 | | | | | 4 | 2.4 | 37 | 5.5 | 222 | 2.9 | 67 | 4.2 | 13 | 3.7 | 29 | 2.5 | 4 | 2.7 | 181 | 7.2 | | | 3 | 2.3 | 3 | 6.5 | 3 | 3.9 | 13 | 1.6 |
| Alkalis..... | 512 | 3.3 | 19 | 22.6 | | | | | 7 | 1.0 | 135 | 1.8 | 139 | 8.8 | 1 | 0.3 | 80 | 6.9 | 7 | 4.7 | 73 | 2.9 | | | 7 | 5.3 | 1 | 2.2 | 2 | 2.6 | 41 | 5.0 |
| High humidity..... | 435 | 2.8 | | | 6 | 2.2 | 12 | 7.2 | 2 | 0.3 | 86 | 1.1 | 160 | 10.1 | 10 | 2.8 | 25 | 2.2 | 2 | 1.3 | 74 | 2.9 | | | 21 | 15.8 | 1 | 2.2 | | | 36 | 4.4 |
| Carbon monoxide..... | 383 | 2.4 | 4 | 4.8 | 1 | 0.4 | 15 | 9.0 | 17 | 2.5 | 225 | 2.9 | 20 | 1.3 | 6 | 1.7 | 51 | 4.4 | 6 | 4.0 | 12 | 0.5 | 1 | 2.1 | 7 | 5.3 | 1 | 2.2 | | | 17 | 2.1 |
| Lead..... | 368 | 2.3 | | | | | | | 75 | 11.1 | 134 | 1.7 | 32 | 2.0 | 7 | 2.0 | 60 | 5.2 | 2 | 1.3 | 58 | 2.3 | | | | | | | | | | |
| Paints..... | 351 | 2.2 | 1 | 1.2 | | | | | 78 | 11.5 | 231 | 3.0 | 4 | 0.3 | | | 20 | 1.7 | 1 | 0.7 | 13 | 0.5 | | | 3 | 2.3 | | | | | | |
| Mineral acids..... | 314 | 2.0 | | | 15 | 5.6 | | | | | 99 | 1.3 | 28 | 1.8 | | | 80 | 6.9 | | | 80 | 3.2 | | | 4 | 3.0 | | | | | 8 | 1.0 |
| Oil (not petroleum)..... | 223 | 1.4 | | | | | | | 79 | 11.7 | 2 | * | 75 | 4.7 | 12 | 3.4 | | | 3 | 2.0 | 14 | 0.6 | 3 | 6.4 | 15 | 11.3 | 2 | 4.3 | 2 | 2.6 | 16 | 2.0 |
| Non-siliceous dusts..... | 214 | 1.4 | | | 62 | 23.2 | | | 9 | 1.3 | 58 | 0.8 | | | 14 | 4.0 | 5 | 0.4 | 8 | 5.3 | 9 | 0.4 | | | | | 5 | 10.9 | | | 44 | 5.4 |
| Salts (N. O. S.)..... | 212 | 1.3 | 1 | 1.2 | 133 | 49.8 | 4 | 2.4 | 4 | 0.6 | | | 6 | 0.4 | | | 42 | 3.6 | 1 | 0.7 | 16 | 0.6 | | | 3 | 2.3 | | | | | 2 | 0.2 |
| Alcohols, esters and ethers..... | 209 | 1.3 | | | | | | | 36 | 5.3 | | | 4 | 0.1 | 42 | 2.7 | | | 7 | 2.0 | 12 | 1.0 | | | 106 | 4.2 | | | | | 2 | 0.2 |
| Infections..... | 202 | 1.3 | | | 5 | 1.9 | | | | | 30 | 0.4 | | | 3 | 0.9 | | | | | 82 | 3.2 | 2 | 4.3 | 24 | 18.0 | 4 | 8.7 | | | 52 | 6.4 |
| Bituminous coal dust..... | 201 | 1.3 | 5 | 6.0 | 1 | 0.4 | 51 | 30.7 | 8 | 1.2 | 51 | 0.7 | 5 | 0.3 | 3 | 0.9 | 39 | 3.4 | 4 | 2.7 | 12 | 0.5 | 1 | 2.1 | 7 | 5.3 | 2 | 4.3 | | | 12 | 1.5 |
| Medicinals..... | 168 | 1.1 | | | | | | | | | 7 | 0.1 | 5 | 0.3 | | | 3 | 0.3 | | | 152 | 6.0 | | | | | | | | | 1 | 0.1 |
| Coal tar products..... | 147 | 0.9 | | | | | | | 2 | 0.3 | 25 | 0.4 | | | 2 | 0.6 | | | | | 15 | 0.6 | | | 6 | 4.5 | | | | | 94 | 11.5 |
| Silica dust..... | 131 | 0.8 | | | | | | | 4 | 0.6 | 71 | 0.9 | | | 2 | 0.6 | 34 | 2.9 | | | | | | | | | | | | | 20 | 2.5 |
| Sulphur dioxide..... | 129 | 0.8 | 4 | 4.8 | 1 | 0.4 | 14 | 8.4 | 6 | 0.9 | 5 | 0.1 | 10 | 0.6 | | | 66 | 5.7 | 3 | 2.0 | 10 | 0.4 | 1 | 2.1 | 4 | 3.0 | 1 | 2.2 | | | 4 | 0.5 |
| Sulphur..... | 124 | 0.8 | 16 | 19.0 | 23 | 10.5 | | | | | 13 | 0.2 | | | | | 33 | 2.9 | | | 7 | 0.3 | | | | | | | | | 27 | 3.3 |
| Inks..... | 107 | 0.7 | 2 | 2.4 | 1 | 0.4 | | | 8 | 1.2 | 2 | * | | | 7 | 2.0 | | | | | 76 | 3.0 | | | 2 | 1.5 | 4 | 8.7 | 2 | 2.6 | 3 | 0.4 |
| Halogenated hydrocarbons..... | 82 | 0.5 | | | | | | | 4 | 0.6 | 2 | * | | | 11 | 3.1 | | | | | 65 | 2.6 | | | 1 | 0.8 | | | | | | |
| Asbestos dust..... | 73 | 0.5 | | | | | | | 1 | 0.1 | 63 | 0.9 | 2 | 0.1 | | | | | | | 1 | * | | | | | | | | | | |
| Lacquers..... | 67 | 0.4 | | | | | | | 66 | 9.7 | 1 | * | | | | | | | | | | | | | | | | | | | | |
| Organic acids..... | 40 | 0.3 | | | | | | | | | 6 | 0.1 | | | | | 1 | 0.1 | | | 28 | 1.1 | | | | | | | | | 5 | 0.6 |
| Arsenic..... | 33 | 0.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dyes..... | 32 | 0.2 | | | | | | | 10 | 1.5 | 7 | 0.1 | | | 10 | 2.8 | | | | | | | | | | | | | | | | |
| Hydrogen sulphide..... | 22 | 0.1 | | | | | | | | | 10 | 0.1 | | | | | | | | | 2 | 0.1 | | | | | | | | | 3 | 0.4 |
| Benzene..... | 18 | 0.1 | | | | | 4 | 2.4 | 10 | 1.5 | 1 | * | | | | | | | | | 1 | * | | | | | | | | | 11 | 1.3 |
| Antimony..... | 17 | 0.1 | | | | | | | | | | | | | | | | | | | 3 | 0.1 | | | | | | | | | | |
| Fluorides..... | 14 | 0.1 | | | | | | | | | 1 | * | | | | | 14 | 1.2 | | | 16 | 0.6 | | | | | | | | | | |
| Mercury..... | 10 | 0.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aldehydes..... | 10 | 0.1 | | | | | | | | | | | | | | | | | | | 10 | 0.4 | | | | | | | | | | |
| Aniline..... | 8 | 0.1 | | | | | | | 5 | 0.7 | | | | | 2 | 0.6 | | | | | 1 | * | | | | | | | | | 4 | 0.5 |
| Chromium..... | 8 | 0.1 | | | | | | | 5 | 0.7 | | | | | | | | | | | | | | | | | | | | | | |
| Amines..... | 6 | * | | | | | | | | | | | | | | | | | | | 3 | 0.1 | | | | | | | | | | |
| Chlorine..... | 5 | * | | | | | | | | | | | | | | | | | | | 6 | 0.2 | | | | | | | | | | |
| Cyanides..... | 5 | * | | | 1 | 0.4 | | | | | | | | | | | | | | | 5 | 0.2 | | | | | | | | | | |
| Manganese..... | 2 | * | | | | | | | 2 | 0.3 | | | | | | | | | | | 4 | 0.2 | | | | | | | | | | |
| Phosphorus..... | 2 | * | 2 | 2.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

*Less than 0.1%
(N. O. S.) Not otherwise specified.



Chemical and Allied Industries

Exposures: Table 18 shows the number and percentage of workers exposed to the specific materials in all chemical and allied industries, according to each sub-division. For the industry as a whole extreme temperature changes, metals (N.O.S.), dermatitis producers, petroleum products, organic dusts, gases (N.O.S.), silicate dusts and organic solvents seem to be the chief exposures. Extreme temperature changes head the list because of the concentration of petroleum refineries, chemical works, and gas works in the state. Metals run high because of the large paint industry in the state, as well as the large maintenance crews in the oil refineries. Petroleum products are high in the list because of the large refineries.

Control Measures: The types of control used by industry for various exposures are noted on Table 19. For example, of the 911 workers potentially exposed to materials capable of producing some sort of dermatitis, only 11.5% had control measures instituted, and in this instance it was protective clothing (gloves usually). Lead dust is controlled by positive and negative ventilation, as well as by local exhausts, enclosed methods, wet methods and respirators. Of the respirators provided by industry, 14.1% of the workers exposed to lead had respirators which were not approved for lead, while only 5.4% had approved type respirators. This was seen in other industries also and at an early date lists of approved types of respirators for various exposures were sent to Indiana plants for their guidance.

TABLE 19—CHEMICAL AND ALLIED INDUSTRIES—PERCENT OF WORKERS EXPOSED TO SPECIFIED MATERIALS HAVING INDICATED CONTROLS
107 Plants; 15,741 Workers

| MATERIAL | Number of workers exposed | PERCENT OF EMPLOYED WORKERS HAVING INDICATED TYPE OF CONTROL | | | | | | | | | | Percent of exposed workers having one or more controls | |
|----------------------------------|---------------------------|--|----------|---------------|------------------|------------|----------|---------------|--------------|---------------------|---------------------|--|-------|
| | | General ventilation | | Local exhaust | Enclosed process | Wet method | Gas mask | Respirator | | Air line respirator | Protective clothing | | Other |
| | | Positive | Negative | | | | | Approved type | Not approved | | | | |
| Extreme temperature changes..... | 1,379 | 0.2 | 1.1 | 0.7 | 0.4 | 8.7 | | 1.9 | 1.3 | 0.1 | 0.6 | 6.7 | 8.6 |
| Metals (N. O. S.)..... | 1,185 | | 0.9 | 4.3 | 1.7 | | | | | | 0.2 | | 17.0 |
| Dermatitis products..... | 911 | | | | 20.0 | | | 3.4 | 13.2 | | 11.5 | | 20.8 |
| Petroleum products..... | 843 | 7.3 | 8.8 | 19.6 | 7.3 | | | | | | 0.7 | 0.8 | 41.7 |
| Organic dusts..... | 825 | | 3.0 | 2.8 | 16.7 | 2.3 | | 6.8 | 2.7 | | | | 25.6 |
| Gases (N. O. S.)..... | 786 | 1.0 | 2.4 | 8.3 | 1.8 | | | 3.9 | 1.4 | | 1.6 | | 21.3 |
| Silicate dusts..... | 702 | 0.7 | 2.9 | 4.0 | 18.3 | | | 1.4 | 0.2 | | | | 28.3 |
| Organic solvents..... | 579 | 10.4 | 7.9 | 10.2 | 0.7 | 0.4 | | 1.0 | 10.4 | | 11.7 | 0.4 | 12.9 |
| Chemicals (N. O. S.)..... | 512 | 5.9 | 13.3 | 10.2 | 16.8 | | | | | | | | 43.3 |
| Alkalis..... | 435 | 12.7 | 26.2 | 7.1 | 1.4 | | | | | | | | 34.0 |
| High humidity..... | 383 | | 1.8 | 4.7 | | | | | 1.3 | | | | 7.8 |
| Carbon monoxide..... | 368 | 5.7 | 1.1 | 11.7 | 14.4 | 1.1 | | 5.4 | 14.1 | | 3.8 | | 36.7 |
| Lead..... | 351 | | 0.6 | 7.1 | | | | 7.7 | 3.7 | | | | 16.6 |
| Paints..... | 351 | | 0.6 | 7.1 | | | | | 3.7 | | | | 16.6 |
| Mineral acids..... | 314 | 8.3 | 13.7 | 5.1 | 22.3 | | 2.2 | | 5.4 | | 21.0 | 4.5 | 62.4 |
| Oils (not petroleum)..... | 223 | 0.4 | 4.0 | 1.8 | 4.5 | | | | 0.4 | | 2.7 | | 11.2 |
| Non-siliceous dusts..... | 214 | | 6.5 | 1.4 | 1.4 | 0.5 | | 9.8 | 30.8 | | 12.6 | | 56.6 |
| Salts (N. O. S.)..... | 212 | | 1.4 | 23.1 | 1.4 | | | 3.3 | 17.0 | | | | 42.8 |
| Alcohols, esters and ethers..... | 209 | 19.2 | 45.8 | 17.2 | 17.2 | | 0.5 | | 1.4 | | 3.8 | 10.1 | 65.6 |
| Infections..... | 202 | | | | | | | | | | | | 9.9 |
| Bituminous coal dust..... | 201 | | 0.5 | 32.2 | 7.1 | | | | 1.5 | | | | 2.0 |
| Medicinals..... | 168 | | 11.9 | | 1.4 | | | | 24.4 | | 1.8 | | 48.2 |
| Coal tar products..... | 147 | | 4.1 | | 1.4 | | | | | | 2.7 | | 8.2 |
| Silica dust..... | 131 | | 3.1 | 3.1 | 22.1 | | | 29.0 | 6.1 | 3.1 | | | 64.8 |
| Sulphur dioxide..... | 129 | | | | 21.7 | | | | | | | | 24.8 |
| Sulphur..... | 124 | | 4.8 | | 9.7 | 1.6 | | 8.1 | 33.9 | | | 21.8 | 70.9 |
| Inks..... | 107 | | | | | | | | | | | | |
| Halogenated hydrocarbons..... | 82 | | 14.6 | 12.2 | 9.8 | | | | | | | | 22.0 |
| Asbestos dust..... | 73 | | 2.7 | 2.7 | | | 4.9 | | 7.3 | | | | 5.5 |
| Lacquers..... | 67 | | 1.5 | 22.4 | 4.5 | | | | 5.5 | | | | 26.9 |
| Organic acids..... | 40 | 5.0 | 32.5 | 55.0 | 7.5 | | | | 47.5 | | | 7.5 | 97.5 |
| Arsenic..... | 33 | | | 57.6 | 51.5 | | | | 93.9 | | 33.3 | | 100.0 |
| Dyes..... | 32 | | 3.1 | 25.0 | 3.1 | | | | | | 3.1 | | 34.3 |
| Hydrogen sulphide..... | 22 | | | | | | 45.4 | | | | | | 45.4 |
| Benzene..... | 18 | | | | | | | | | | | | |
| Antimony..... | 17 | | | 29.4 | | | | | | | | | 29.4 |
| Fluorides..... | 14 | | | 14.3 | 14.3 | | | | | | | | 71.5 |
| Mercury..... | 10 | | | 40.0 | 40.0 | 30.0 | | | 57.2 | | 60.0 | | 60.0 |
| Aldehydes..... | 10 | | | | | | | | | | | | |
| Aniline..... | 8 | | 12.5 | | | | | | | | | | |
| Chromium..... | 8 | | 25.0 | | | | | | 25.0 | | | | |
| Amines..... | 6 | | 100.0 | | | | | | | | | | |
| Chlorine..... | 5 | | | | | | | | | | | | |
| Cyanides..... | 5 | | | | | | | | | | | | |
| Manganese..... | 2 | | | | | | | | | | | | |
| Phosphorus..... | 2 | | | 80.0 | 80.0 | 60.0 | | | 20.0 | | 80.0 | | 100.0 |

(N. O. S.) Not otherwise specified.

Occupational Analysis of Paint Industry: By rearranging the exposures listed on Table 18 for the paint and varnish industry and listing these in descending order and by listing the occupations where these exposures occur, we derive Table 20. Thus it can be seen that for the paint industry the exposure to organic solvents is a sizeable one. Should the industry care to minimize this exposure it can be seen by referring to Table 20 that the occupations that contributed mostly to this exposure are the mixers, lacquer and varnish makers, cookers, paint grinders, thinners and reducers. Thus adequate control measures for this group of occupations would greatly minimize the hazard of pathology due to organic solvents.

TABLE 20—PAINT AND VARNISH INDUSTRY¹
MATERIAL EXPOSURE BY OCCUPATION

Survey Data: 17 Plants; 678 Employees; 349 Employees were given 842 Exposures

| OCCUPATION | NUMBER OF WORKERS EXPOSED TO SPECIFIED MATERIALS BY OCCUPATION | | | | | | | | | | | | | | | | |
|---|--|-------------------|---------------------|--------|------|----------|---------------|----------------------|-----------------------------|--------------------|----------------------|----------------|-----------------|------------------|-----------------------------|--------------------------------------|--|
| | Organic solvents ¹ | Metals (N. O. S.) | Oil (not petroleum) | Paints | Lead | Lacquers | Organic dusts | Chemicals (N. O. S.) | Alcohols, esters and ethers | Petroleum products | Dermatitis producers | Silicate dusts | Carbon monoxide | Gases (N. O. S.) | Extreme temperature changes | Miscellaneous ² materials | |
| TOTAL NUMBER OF WORKERS EXPOSED..... | 134 | 83 | 79 | 78 | 75 | 66 | 48 | 37 | 36 | 29 | 23 | 19 | 17 | 13 | 12 | 93 | |
| Mixers..... | 38 | 32 | 33 | 12 | 30 | 14 | 10 | 2 | 15 | 7 | ... | 2 | ... | ... | ... | ... | |
| Lacquer and varnish makers, cooks..... | 19 | 13 | 14 | ... | 2 | 2 | 23 | 7 | 7 | ... | ... | ... | ... | 5 | 10 | ... | |
| Paint grinders, makers, grinder mill men..... | 18 | 13 | 13 | 25 | 22 | 3 | 7 | ... | 2 | 5 | ... | 1 | ... | ... | 2 | 2 | |
| Thinners, reducers..... | 10 | 5 | ... | ... | 3 | ... | ... | ... | 2 | ... | ... | ... | ... | ... | ... | ... | |
| Fillers (fill containers with products)..... | 9 | ... | 6 | 17 | ... | 2 | ... | ... | ... | 2 | ... | ... | ... | ... | ... | ... | |
| Stain and filler makers..... | 7 | ... | ... | ... | 3 | ... | ... | ... | 6 | ... | ... | ... | ... | ... | ... | ... | |
| Tinters..... | 6 | 6 | 7 | 6 | 4 | 3 | ... | ... | 1 | 3 | ... | ... | ... | ... | ... | ... | |
| Printers, pressmen, typesetters..... | 6 | 1 | ... | ... | 3 | ... | ... | ... | ... | 1 | ... | ... | ... | ... | ... | ... | |
| Mechanics, maintenance men..... | 6 | 6 | ... | ... | ... | ... | ... | ... | 6 | ... | ... | 1 | 5 | 4 | ... | ... | |
| Washers, cleaners..... | 4 | 1 | ... | ... | ... | 4 | ... | ... | ... | ... | 1 | ... | 2 | ... | ... | ... | |
| Product testers, painters, chemists..... | 4 | 4 | ... | 15 | 9 | 15 | ... | 34 | 1 | ... | ... | ... | ... | ... | ... | ... | |
| Foremen, managers, supervisors..... | 3 | ... | 2 | ... | 5 | ... | 1 | 1 | 2 | ... | ... | ... | ... | ... | ... | ... | |
| Filterers, strainers..... | 2 | ... | 3 | 1 | ... | 4 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| Engineers, firemen..... | 1 | ... | ... | ... | 3 | ... | 1 | ... | 2 | ... | ... | 7 | 9 | 2 | ... | ... | |
| Loaders, unloaders, storage room men..... | ... | 2 | ... | ... | 2 | ... | 2 | ... | 1 | ... | ... | ... | ... | ... | ... | ... | |
| Order fillers, shipping clerks..... | ... | ... | ... | ... | ... | 8 | ... | ... | ... | ... | 2 | ... | ... | ... | ... | ... | |
| Labellers..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 1 | 18 | ... | ... | ... | ... | ... | |
| Glass cutters, glass workers, glazers..... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 8 | ... | ... | ... | ... | |
| Miscellaneous..... | 1 | ... | 1 | 2 | ... | ... | 5 | ... | ... | ... | 2 | ... | 1 | ... | ... | 93 | |

¹The paint and varnish industry includes paint, varnish, lacquer, wood stain and filler manufacturing.

²Organic solvents in this industry are generally turpentine, naphtha, gasoline, toluol, xylol, oleum spirits and kerosene.

³The next largest material is approximately 1.2% of the total number of exposures.

(N. O. S.) Not otherwise specified.

The same procedure may be used for other occupational analyses. The paint industry was not chosen for an occupational breakdown because of any preponderance of disturbing materials used in the manufacturing of paints, but because it is an industry on which occupational data was lacking.

•
CIGAR AND
TOBACCO
INDUSTRY
•

Cigar and Tobacco Industry

Exposures: 11 of the 51 major groups were encountered in this relatively small industry in Indiana. Exposures were chiefly to dermatitis producers, organic dusts, high humidity and petroleum products. Dermatitis in the tobacco industry may be encountered through specific irritant properties of tobacco dust.²¹ The dermatoses may be allergic, infectious, or irritative and generally appear among the waterers, sorters, and pressers.

Controls: The only control encountered in the industry was for organic dusts. Local exhaust methods were used for 7.9% of the 190 exposures to organic dusts. (See Table 21 for detailed study.)

TABLE 21—CIGAR AND TOBACCO

| MATERIAL | NUMBER AND PERCENT OF WORKERS EXPOSED TO SPECIFIED MATERIAL | |
|------------------------------------|---|---------|
| | Number | Percent |
| TOTAL NUMBER WORKERS EMPLOYED..... | 1,035 | ..... |
| Dermatitis producers..... | 379 | 36.6 |
| Organic dusts..... | 190 | 18.4 |
| High humidity..... | 33 | 3.2 |
| Petroleum products..... | 22 | 2.1 |
| Other metals..... | 4 | 0.4 |
| Non-siliceous dust..... | 4 | 0.4 |
| Silicate dust..... | 3 | 0.3 |
| Bituminous coal dust..... | 3 | 0.3 |
| Carbon monoxide..... | 3 | 0.3 |
| Sulphur dioxide..... | 3 | 0.3 |
| Medicinals..... | 1 | * |

*Less than 0.1%

CIGAR AND TOBACCO—CONTROLS

The only control in this industry consists of Local Exhaust as a control for Organic Dusts; 7.9% of the 190 exposures to Organic Dusts were credited this control.

•
CLAY, GLASS
AND STONE
•



Mined limestone ready for loading.

Clay, Glass and Stone Industry

Exposures: Table 22 presents the data on exposures to materials contacted in this industry. Forty-one of the 51 major groups were encountered, of which non-siliceous dusts, silicate dusts, extreme temperature changes, silica dust, gases (N.O.S.) and metals (N.O.S.) predominated. Since the limestone, cement and rock wool industries are large industries in the state, one would anticipate a preponderance of non-siliceous dust exposures. Silica bearing dust is relatively high in this series and is encountered in some of the high silica bearing Indiana clays used in the brick, tile, terra cotta, and pottery industries. This type of dust potentially may produce silicosis. It should be noted that a rather sizeable group of people are potentially exposed to asbestos dust (159) and that they may, through these exposures, develop asbestosis.

Controls: Table 23 indicates the controls encountered in the handling of materials workers were exposed to in Table 22. For example, it is noted that the 1,675 persons exposed to silica bearing dusts, 45% have one or more controls instituted. The methods used were chiefly local exhaust, enclosure, wet methods, and respirators. Again it should be pointed out that 5.1% of the workers exposed to silica dust were provided with respirators which were not of the approved type for silica.

Cement Industry; Occupational Analysis: Table 24 presents the most common exposures for the cement industry as well as the occupations where these exposures tend to occur. It can be seen for carbon monoxide, for example, that of the 75 potential exposures listed that 33 of them are potentially present in the occupations listed as kiln operators, feeders and chargers.

The most common exposures for the cement industry are non-siliceous dust, silicate dusts, dermatitis producers, bituminous coal dust and silica dust.

Lime and Artificial Stone Industry; Occupational Analysis: Data is presented in Table 25. The most common exposure is to non-siliceous dusts and occurs primarily in the cutting operations listed as planers, shapers, sawyers, stonecutters and channeling machine operators. Adequate control measures in this group would practically solve this dust problem.

Rock Wool Industry; Occupational Analysis: Table 26 conveys the same information for the rock wool industry as does Table 24 and 25 for the cement and limestone industry as a whole. Rock wool industry is quite a sizeable industry in Indiana due to the fact that some of the Indiana limestone is quite adaptable to the manufacture of rock wool. The chief exposure is non-siliceous dust.

TABLE 22—CLAY, GLASS & STONE

| MATERIAL | NUMBER AND PERCENT OF WORKERS IN EACH SUB GROUP EXPOSED TO SPECIFIED MATERIALS | | | | | | | | | | | | | | | | | | | | | |
|------------------------------------|--|-------|--------------------------|-------|---------|-------|--------|-------|--------|-------|---------------------------|-------|------------------|-------|-----------|-------|---------------------|-------|-------------------|-------|--------------------------------|-------|
| | Total | | Brick, tile, terra cotta | | Mirrors | | Glass | | Cement | | Lime and Artificial stone | | Marble and stone | | Potteries | | Roofing and asphalt | | Asbestos products | | Rock wool and other (N. O. S.) | |
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| TOTAL NUMBER WORKERS EMPLOYED..... | 15,343 | ..... | 2,050 | 13.4 | 157 | 1.0 | 11,507 | 42.4 | 1,500 | 9.8 | 2,293 | 14.9 | 152 | 1.0 | 715 | 4.6 | 179 | 1.2 | 615 | 4.0 | 1,175 | 7.7 |
| Non-siliceous dusts..... | 2,859 | 18.6 | 450 | 22.0 | 9 | 5.7 | 235 | 3.6 | 318 | 21.2 | 1,170 | 51.0 | 15 | 9.9 | 91 | 12.7 | 22 | 12.3 | 25 | 4.1 | 524 | 44.6 |
| Siliceous dusts..... | 2,308 | 15.0 | 101 | 9.3 | 59 | 37.6 | 1,195 | 18.4 | 261 | 17.4 | 38 | 1.6 | 51 | 33.6 | 190 | 26.6 | 23 | 12.8 | 50 | 8.1 | 252 | 21.4 |
| Extreme temperature changes..... | 1,942 | 12.7 | 190 | 14.1 | ..... | ..... | 1,359 | 20.6 | 67 | 4.5 | 5 | 0.3 | ..... | ..... | 36 | 7.8 | 2 | 1.1 | 23 | 3.7 | 157 | 13.1 |
| Silica dust..... | 1,675 | 10.9 | 718 | 35.0 | 7 | 4.5 | 367 | 5.6 | 102 | 6.8 | 5 | 0.3 | 31 | 20.4 | 340 | 47.6 | ..... | ..... | 3 | 0.5 | 102 | 8.7 |
| Gases (N. O. S.)..... | 1,344 | 8.8 | 151 | 7.4 | 3 | 1.9 | 907 | 13.9 | 168 | 4.5 | 44 | 1.9 | ..... | ..... | 28 | 3.9 | 14 | 7.8 | 20 | 3.3 | 109 | 9.3 |
| Metals (N. O. S.)..... | 1,230 | 8.0 | 55 | 2.7 | 39 | 24.8 | 889 | 13.4 | 75 | 5.0 | 39 | 3.8 | 2 | 1.3 | 15 | 2.1 | 7 | 3.9 | 29 | 4.7 | 153 | 4.5 |
| Petroleum products..... | 664 | 4.3 | 43 | 2.1 | ..... | ..... | 358 | 5.5 | 80 | 5.3 | 73 | 3.1 | 1 | 0.7 | 18 | 2.5 | 13 | 7.3 | 16 | 2.6 | 42 | 3.5 |
| Bituminous coal dust..... | 647 | 4.2 | 232 | 11.3 | 1 | 0.6 | 120 | 1.8 | 134 | 8.9 | 73 | 3.1 | 2 | 1.3 | 31 | 4.3 | 2 | 1.1 | 12 | 2.0 | 70 | 6.0 |
| Dermatitis producers..... | 523 | 3.4 | 43 | 2.1 | 6 | 3.8 | 222 | 3.4 | 175 | 11.6 | 49 | 2.1 | 3 | 2.0 | 15 | 2.1 | 7 | 3.9 | 16 | 2.6 | 29 | 2.4 |
| Carbon monoxide..... | 477 | 3.1 | 146 | 7.1 | ..... | ..... | 137 | 2.1 | 31 | 2.1 | 8 | 0.3 | 1 | 0.7 | 22 | 3.1 | 8 | 4.5 | 11 | 1.8 | 39 | 3.2 |
| Organic dusts..... | 355 | 2.3 | 9 | 0.4 | 5 | 3.2 | 140 | 2.2 | 31 | 2.1 | 8 | 0.3 | 1 | 0.7 | 13 | 1.8 | 3 | 1.7 | 15 | 2.4 | 68 | 4.9 |
| Organic solvents..... | 260 | 1.7 | 6 | 0.3 | 5 | 3.2 | 117 | 1.8 | 30 | 2.0 | 3 | 0.3 | ..... | ..... | 12 | 1.6 | 2 | 1.1 | 53 | 8.6 | 28 | 2.4 |
| Sulphur dioxide..... | 247 | 1.6 | 108 | 5.3 | ..... | ..... | 60 | 0.9 | 15 | 0.9 | 19 | 0.8 | 3 | 2.0 | 22 | 3.1 | 7 | 3.9 | 5 | 0.8 | 15 | 1.5 |
| High humidity..... | 222 | 1.4 | 46 | 2.2 | 5 | 3.2 | 81 | 1.2 | 5 | 0.3 | 11 | 0.7 | ..... | ..... | 2 | 0.3 | 2 | 1.1 | 1 | 0.2 | ..... | ..... |
| Alkalis..... | 173 | 1.1 | 5 | 0.2 | 3 | 1.9 | 89 | 1.4 | 40 | 2.7 | ..... | ..... | ..... | ..... | 33 | 4.6 | 2 | 1.1 | ..... | ..... | ..... | ..... |
| Asbestos dust..... | 159 | 1.0 | ..... | ..... | ..... | ..... | ..... | ..... | 26 | 1.7 | ..... | ..... | ..... | ..... | 43 | 6.0 | ..... | ..... | 155 | 25.2 | 47 | 4.0 |
| Paints..... | 156 | 1.0 | 10 | 0.5 | 3 | 1.9 | 27 | 0.4 | 26 | 1.7 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 27 | 4.4 | 10 | 0.9 |
| Sulphur..... | 149 | 1.0 | ..... | ..... | ..... | ..... | 122 | 1.9 | ..... | ..... | ..... | ..... | ..... | ..... | 9 | 1.3 | ..... | ..... | 22 | 3.6 | 10 | 0.9 |
| Lead..... | 128 | 0.8 | 9 | 0.4 | 1 | 0.6 | 66 | 1.0 | 10 | 0.7 | 1 | ..... | ..... | ..... | 1 | 0.1 | 2 | 1.1 | 10 | 1.6 | 24 | 2.0 |
| Chemicals (N. O. S.)..... | 95 | 0.6 | 6 | 0.3 | 2 | 1.3 | 24 | 0.4 | 40 | 2.7 | ..... | ..... | ..... | ..... | ..... | ..... | 3 | 1.7 | 16 | 2.6 | ..... | ..... |
| Coal tar products..... | 94 | 0.6 | ..... | ..... | ..... | ..... | 43 | 0.7 | 8 | 0.5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Arsenic..... | 77 | 0.5 | ..... | ..... | ..... | ..... | 77 | 1.2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Salts (N. O. S.)..... | 57 | 0.4 | 9 | 0.4 | ..... | ..... | 47 | 0.7 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Fluorides..... | 44 | 0.3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Aldehydes..... | 39 | 0.3 | ..... | ..... | ..... | ..... | 29 | 0.4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Selenium..... | 29 | 0.2 | ..... | ..... | ..... | ..... | 22 | 0.3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Inks..... | 22 | 0.1 | 7 | 0.3 | ..... | ..... | 22 | 0.3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Dyes..... | 21 | 0.1 | 3 | 0.1 | ..... | ..... | 3 | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Oil (not petroleum)..... | 17 | 0.1 | ..... | ..... | ..... | ..... | ..... | ..... | 8 | 0.5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Benzene..... | 17 | 0.1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Mineral acids..... | 13 | ..... | 2 | 1.3 | 2 | 1.3 | 7 | 0.1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Lacquers..... | 13 | ..... | 4 | 2.5 | 4 | 2.5 | 6 | ..... | 4 | 0.3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Medicines..... | 11 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Alcohols, esters and ethers..... | 10 | ..... | 6 | 3.8 | 6 | 3.8 | 10 | 0.2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Accelerators..... | 9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 8 | 0.5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Anthraxite coal dust..... | 8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Halogenated hydrocarbons..... | 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Organic acids..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Cadmium..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Antimony..... | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2 | 0.1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Manganese..... | 1 | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

*Less than 0.1%
(N. O. S.) Not otherwise specified.

TABLE 23—CLAY, GLASS AND STONE INDUSTRIES—CONTROLS
169 Plants—15,343 Employees

| MATERIAL | Number of workers exposed | PERCENT OF EXPOSED WORKERS HAVING INDICATED TYPE OF CONTROL | | | | | | | | | | Percent of exposed workers having one or more controls |
|----------------------------------|---------------------------|---|----------|---------------|------------------|------------|----------|---------------|--------------|---------------------|---------------------|--|
| | | General ventilation | | Local exhaust | Enclosed process | Wet method | Gas mask | Respirator | | Air line respirator | Protective clothing | Other |
| | | Positive | Negative | | | | | Approved type | Not approved | | | |
| Non-siliceous dusts..... | 2,850 | 2.2 | 5.3 | 13.2 | 4.9 | 15.3 | ..... | 4.4 | 2.0 | 0.3 | ..... | 39.7 |
| Silicate dusts..... | 2,308 | 8.5 | 3.3 | 17.7 | 3.2 | 6.1 | ..... | 12.1 | 2.8 | ..... | ..... | 47.0 |
| Extreme temperature changes..... | 1,942 | 21.2 | 8.9 | 15.9 | 0.4 | ..... | ..... | ..... | ..... | ..... | 5.2 | 4.0 |
| Silica dust..... | 1,875 | 19.6 | 3.3 | 16.4 | 5.2 | 7.3 | ..... | 17.4 | 5.1 | * | ..... | 0.9 |
| Gases (N. O. S.)..... | 1,844 | 12.2 | 21.6 | 10.6 | 1.7 | ..... | ..... | 2.9 | 0.9 | ..... | 0.7 | ..... |
| Metals (N. O. S.)..... | 1,230 | 7.6 | 4.1 | 10.4 | 1.8 | 8.9 | ..... | ..... | 0.8 | ..... | ..... | 32.3 |
| Petroleum products..... | 664 | 13.1 | ..... | 4.1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 16.7 |
| Bituminous coal dust..... | 647 | 1.7 | 0.6 | 3.4 | 6.5 | ..... | ..... | 3.6 | 1.9 | ..... | ..... | 17.6 |
| Dermatitis producers..... | 523 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Carbon monoxide..... | 477 | ..... | 7.3 | 2.3 | 4.4 | ..... | ..... | ..... | 0.2 | ..... | ..... | 13.4 |
| Organic solvents..... | 355 | 7.9 | 9.0 | 43.1 | 4.8 | 3.4 | ..... | 0.6 | 2.3 | ..... | ..... | 63.9 |
| Sulphur dioxide..... | 260 | 0.4 | 4.6 | 4.2 | ..... | ..... | ..... | 5.4 | 3.1 | ..... | ..... | 15.3 |
| High humidity..... | 247 | ..... | 1.2 | ..... | 4.6 | ..... | ..... | ..... | 0.4 | ..... | ..... | 6.1 |
| Alkalis..... | 222 | 0.5 | 12.6 | 4.5 | 1.8 | ..... | ..... | ..... | ..... | ..... | ..... | 14.9 |
| Asbestos dust..... | 173 | ..... | 9.2 | 17.3 | 0.6 | ..... | ..... | 9.8 | 10.4 | ..... | 2.9 | 42.8 |
| Paints..... | 156 | 0.6 | 38.4 | 37.7 | 16.4 | ..... | ..... | 0.6 | 2.5 | ..... | ..... | 69.2 |
| Sulphur..... | 149 | 6.7 | 1.3 | 14.1 | 2.0 | ..... | ..... | 9.6 | 4.5 | ..... | ..... | 27.6 |
| Lead..... | 128 | ..... | ..... | 14.1 | 2.3 | ..... | ..... | 8.6 | ..... | ..... | ..... | 17.4 |
| Chemicals (N. O. S.)..... | 95 | ..... | 21.1 | 4.2 | ..... | ..... | ..... | ..... | 4.2 | ..... | ..... | 19.5 |
| Coal tar products..... | 94 | 5.2 | 3.2 | 18.1 | 3.2 | 3.9 | ..... | 8.5 | ..... | ..... | ..... | 25.3 |
| Arsenic..... | 77 | ..... | ..... | 23.4 | ..... | ..... | ..... | ..... | 44.2 | ..... | ..... | 26.6 |
| Salts (N. O. S.)..... | 67 | 10.5 | 1.8 | ..... | ..... | ..... | ..... | 31.6 | ..... | ..... | ..... | 67.5 |
| Fluorides..... | 44 | ..... | ..... | 4.5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 33.3 |
| Aldehydes..... | 39 | ..... | 7.7 | 7.7 | 15.4 | ..... | ..... | ..... | ..... | ..... | ..... | 4.5 |
| Selenium..... | 29 | ..... | ..... | 48.3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 15.4 |
| Inks..... | 22 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 100.0 | ..... | ..... | 100.0 |
| Dyes..... | 21 | ..... | 19.0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 19.0 |
| Oils (not petroleum)..... | 17 | ..... | 5.9 | 5.9 | 5.9 | ..... | ..... | ..... | ..... | ..... | ..... | 5.9 |
| Benzene..... | 17 | ..... | 17.6 | 17.6 | ..... | ..... | ..... | ..... | 47.1 | ..... | ..... | 64.7 |
| Mineral acids..... | 13 | 30.8 | 15.4 | 15.4 | 7.7 | ..... | ..... | ..... | ..... | ..... | ..... | 46.2 |
| Lacquers..... | 13 | ..... | ..... | 30.8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 30.8 |
| Medicines..... | 11 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Alcohols, esters and ethers..... | 10 | ..... | ..... | 80.0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 100.0 |
| Accelerators..... | 10 | 100.0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Anthracite coal dust..... | 9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 100.0 | ..... | ..... | 100.0 |
| Halogenated hydrocarbons..... | 8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 20.0 |
| Organic acids..... | 5 | ..... | 20.0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 100.0 |
| Cadmium..... | 4 | ..... | ..... | 100.0 | ..... | ..... | ..... | ..... | 100.0 | ..... | ..... | ..... |
| Antimony..... | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Manganese..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

*Less than 0.1%
(N. O. S.) Not otherwise specified.

TABLE 24—CEMENT INDUSTRY¹
MATERIAL EXPOSURE BY OCCUPATION

Survey Data: 24 Plants; 1,500 Employees; 976 Employees were given 1,581 Exposures

| OCCUPATION | NUMBER OF WORKERS EXPOSED TO SPECIFIED MATERIALS BY OCCUPATION | | | | | | | | | | | | | | | |
|--|--|----------------|----------------------|----------------------|--------------|--------------------|-------------------|-----------------|-----------------------------|------------------|---------|----------------------|---------------|------------------|--------|--------------------------------------|
| | Non-siliceous dusts | Silicate dusts | Dermatitis producers | Bituminous coal dust | Silica dusts | Petroleum products | Metals (N. O. S.) | Carbon monoxide | Extreme temperature changes | Gases (N. O. S.) | Alkalis | Chemicals (N. O. S.) | Organic dusts | Organic solvents | Paints | Miscellaneous ² materials |
| TOTAL NUMBER OF WORKERS EXPOSED..... | 318 | 261 | 174 | 133 | 102 | 80 | 75 | 75 | 67 | 68 | 40 | 40 | 31 | 30 | 26 | 61 |
| General laborers, relief men..... | 38 | 22 | 31 | 12 | 4 | 7 | 4 | 4 | 10 | | | | | | | |
| Unloaders, loaders, car fillers..... | 34 | 13 | 5 | | 17 | | | | | | | | | | | |
| Grinders, tube mill operators..... | 26 | 18 | | | | | | | 3 | | | | | | | |
| Kiln operators, feeders, chargers..... | 25 | 16 | | 54 | | | | 33 | 22 | 25 | | | | | | |
| Crusher operators..... | 24 | 24 | | | | | | | 8 | | | | | | | |
| Bin feeders, hopper men..... | 23 | 9 | | 3 | 1 | | | | 6 | | | | | | | |
| Shovel, hoist and crane operators..... | 19 | 1 | 9 | 3 | 4 | | | | | | | | | | | |
| Mixer operators, mixers, blenders..... | 18 | 18 | | | 1 | | | | | | | | 2 | | 5 | |
| Sackers, bag cleaners and sorters..... | 15 | 55 | 16 | | | | | | | | | | 10 | | | |
| Drillers and blasters..... | 13 | | | | | | | 1 | | | | | | | | |
| Foremen and superintendents..... | 10 | 1 | | 5 | 1 | 2 | 1 | 2 | 5 | 1 | | | | | | |
| Clean-up men..... | 9 | 1 | | | | | | | | | | | | | | |
| Cement testers, samplers..... | 8 | 12 | 6 | | 11 | | | | 6 | | | | | | | |
| Drier operators..... | 8 | | | 3 | 8 | | | | 7 | 12 | | | | | | |
| Oilers, belt men, conveyor men..... | 8 | | | 3 | | 26 | | | 3 | | | | | | | |
| Hand truck drivers, transferers..... | 6 | 13 | 2 | | 13 | | | | 2 | | | | | | | |
| Machinists, mechanics, tool makers..... | 4 | 16 | | 6 | | 29 | 32 | 4 | | 2 | | | | 13 | | |
| Brick masons, kiln liners..... | 2 | 2 | 2 | | | | | | | | | | | | | |
| Blacksmiths and welders..... | 1 | 4 | | 2 | | 1 | 25 | 16 | | 18 | | | | | | |
| Cement block, tile, vault makers, helpers..... | | 8 | 32 | | 16 | | | | | | | | | | 5 | |
| Firemen and engineers..... | | 7 | | 20 | 4 | 13 | | 13 | | 1 | | | | | | |
| Coal plant men..... | | 1 | | 15 | | | | | | | | | | | | |
| Electricians..... | | | 15 | | | | | | | | | | | | | |
| Concrete molders, mixers..... | | | 38 | | 21 | | 6 | | | | 38 | | | | | |
| Chemists, research workers, etc..... | | | | | | | | | | | | 39 | | | | |
| Carpenters, woodworkers..... | | | | | | | | | | | | | 18 | | | |
| Painters (brush and dip)..... | | | | | | | | | | | | | | 16 | 16 | |
| Miscellaneous..... | 27 | 20 | 18 | 7 | 1 | 2 | 7 | 2 | 3 | 1 | 2 | 1 | 1 | 1 | | 61 |

¹Cement Industry includes plants manufacturing cement and cement products such as cement tile, block, concrete vaults, slabs, etc. Some plants in the survey make ready-mixed concrete.

²Next largest material is approximately 0.9% of the total number of exposures.
(N. O. S.) Not otherwise specified.

TABLE 25—LIME AND ARTIFICIAL STONE INDUSTRY:
MATERIAL EXPOSURE BY OCCUPATION

Survey Data: 49 Plants; 2,293 Employees; 1,320 Employees were given 1,549 Exposures

| OCCUPATION | NUMBER OF PERSONS EXPOSED TO SPECIFIED MATERIALS BY OCCUPATION | | | | | | | | | | |
|---|--|--------------------------------|-------------------------|-----------------|--------------------|------------------|----------------|-----------------|----------------------------------|-------------|--|
| | Non-siliceous dusts ¹ | Metals (N. O. S.) ² | Bituminous coal dust | Carbon monoxide | Petroleum products | Gases (N. O. S.) | Silicate dusts | Sulphur dioxide | Extreme tempera- ture changes | Silica dust | Miscellaneous ⁴ material |
| TOTAL NUMBER WORKERS EXPOSED..... | 1,170 | 86 | 72 | 49 | 47 | 44 | 36 | 19 | 8 | 5 | 13 |
| Planer, shaper, lathe operators..... | 246 | | | | | | | | | | |
| Sawyers (diamond, gang, rip, etc.)..... | 209 | | | | | | | | | 2 | |
| Stone cutters..... | 187 | | | | | | | | | | |
| Channeling machine operators and helpers..... | 104 | | 6 | 6 | | | 6 | | | | |
| Drillers..... | 64 | | | | | | | | | | |
| Loaders..... | 59 | | | | | | | | | | |
| Stone breakers..... | 45 | | | | | | 6 | | | | |
| Crusher and pulverizer operators and feeders..... | 43 | | | | 3 | 1 | | | | | |
| Rubbers, sanders..... | 41 | | | | | | | | | 1 | |
| Truck drivers, haulers..... | 25 | | | 4 | | | | | | | |
| Crane, hoist and shovel operators..... | 23 | | | | | 1 | | | | | |
| Carvers, fine cutters..... | 19 | | | | | | | | | | |
| Tool makers, grinders, sharpeners..... | 16 | 21 | | | | | 3 | | | | |
| General laborers, clean-up men..... | 10 | | 3 | | | | | | | | |
| Clay strippers..... | 10 | | | | | | | | | | |
| Blasters, shooters..... | 9 | | | | | | | | | | |
| Machine repairmen, millwrights..... | 9 | 12 | | 2 | 36 | 2 | | | | | |
| Lime kiln operators..... | 9 | | 8 | | | 14 | 6 | | 8 | | |
| Milling machine operators..... | 8 | | | | | | | | | | |
| Blacksmith and helper..... | 8 | 51 | 30 | 24 | 2 | 21 | | 9 | | | |
| Car puller and dumper operators..... | 7 | | | | | | | | | | |
| Cement mixers..... | 2 | | | | | | 2 | | | 2 | |
| Firemen (crane, shovel, dinky, boiler, etc.)..... | | | 25 | 12 | | 3 | 12 | 10 | | | |
| Stationery engineers..... | | | | | 5 | 1 | 1 | | | | |
| Miscellaneous..... | 17 | 2 | | 1 | 1 | 1 | | | | | 13 |

¹Primarily limestone quarrying and processing: Does not include brick, tile, terra cotta, cement, marble and natural stone plants, or potteries. Plants where limestone quarrying alone is done are classed under extraction of minerals and not included here.

²Primarily limestone dust in this industry.

³Principally iron and steel dusts.

⁴Next material is approximately 0.5% of the total number of exposures.

(N. O. S.) Not otherwise specified.

TABLE 26—ROCK WOOL INDUSTRY†
MATERIAL EXPOSURE BY OCCUPATION

Survey Data: 12 Plants, 938 Employees: 728 Employees were given 1,550 Exposures

| OCCUPATION | NUMBER OF WORKERS EXPOSED TO SPECIFIED MATERIALS BY OCCUPATION | | | | | | | | | | | | | | | | |
|---------------------------------------|--|----------------|----------------------------------|------------------|-------------|--------------------|--------|------------------|-------------------|---------------|-------------------------|-----------------|-----------|---------------|-------------------------|-------------------|----------------------------|
| | Non-siliceous dusts | Silicate dusts | Extreme tempera- ture changes | Gases (N. O. S.) | Silica dust | Petroleum products | Paints | Organic solvents | Metals (N. O. S.) | Organic dusts | Bituminous coal dust | Carbon monoxide | Aldehydes | High humidity | Dermatitis producers | Coal tar products | Miscellaneous material* |
| TOTAL NUMBER OF WORKERS EXPOSED.... | 517 | 209 | 157 | 109 | 92 | 69 | 47 | 46 | 41 | 38 | 38 | 35 | 33 | 28 | 26 | 24 | 41 |
| Wool take-off men, cutters..... | 120 | 81 | | | 3 | 6 | | | | | | | | | | | |
| Cupola blower operators, tenders..... | 66 | | 95 | 2 | 6 | 30 | | | | | | | 30 | | | | |
| Blanket, batt, flex felt makers..... | 66 | 45 | | | 3 | | 45 | 45 | | | | | | | | | |
| Wool packers, baggers..... | 54 | | | | 9 | | | | | | | | | | | | |
| Cupola chargers..... | 50 | 45 | 48 | 50 | 30 | | | | 3 | | 3 | 2 | | | | | |
| Granulated, beater operators..... | 30 | | | | 6 | | | | | | | | | | | 3 | |
| Rock loaders, breakers..... | 25 | 2 | | | 3 | | | | | | | | 3 | 3 | | | |
| Truckers, wheelers..... | 15 | 9 | | | 6 | | | | | | | | | | | | |
| General laborers, sweepers..... | 14 | | | | 1 | | | | | | | | | | | | |
| Block men..... | 10 | | | | | | | | | | | | | | 10 | | |
| Weighers..... | 9 | | | | 6 | | | | | | | | | | | | |
| Wool drier operators..... | 9 | | 6 | 9 | 6 | | | | | | | | | | | | |
| Machinists..... | 6 | | | 6 | | 2 | | | 8 | | | 6 | | | 6 | | |
| Shovel, hoist operators..... | 6 | 1 | | | 1 | | | | | | 1 | 2 | | | | | |
| Drillers, shooters (quarry)..... | 5 | | | | 1 | | | | | | | | | | | | |
| Maintenance men..... | 5 | | | | | 9 | | | 2 | | | | | | 6 | | |
| Rock crusher operators..... | 4 | | | | 1 | | | | | | | | | | | | |
| Mill men, millwrights..... | 3 | | | 22 | 3 | 20 | | | 23 | | | | | | | | |
| Boiler firemen..... | 2 | 18 | 2 | 12 | | | | | | | 25 | 23 | | 2 | | | |
| Coal wheelers..... | | 6 | | | | | | | | | 6 | | | | | | |
| Ash pullers..... | | 2 | | | | | | | | | | | | | | | |
| Oven men..... | | | 3 | 3 | | | | | | | | | | | | | |
| Sanders..... | | | | | 4 | | | | | | | | | | | | |
| Woodworkers, carpenters..... | | | | | | | 1 | | | 12 | | | | | | | |
| Rock cork workers..... | | | | | | | | | 23 | | | | | | | | |
| Asphalt workers..... | | | | | | | | | | | | | | 5 | | | |
| Miscellaneous..... | 18 | | 3 | 5 | 3 | 2 | 1 | 1 | 5 | 3 | 3 | 2 | | 18 | 4 | 21 | 41 |

†Rock wool plants are classified under Rock Wool, other (N. O. S.) in the clay, glass and stone industries.

Only plants primarily making rock wool are included here. *Next material is less than 1.0% of total number of exposures.

(N. O. S.) Not otherwise specified.

•

CLOTHING
INDUSTRY

•

Clothing Industry

Exposures: Organic dusts, petroleum products and silicate dusts were the materials giving the most potential exposures in the clothing industry. Frequent exposures to high humidity were also noted. The data on physical conditions which are given for this industry or any industry in this survey are of limited value only. No actual measurements of physical conditions were made and the reporting of potential exposures to such conditions depended upon the personal judgment of the surveyor and his knowledge in the industry. These physical data have been included to indicate where one may make studies of such environments. (See Table 27 for detailed analysis of the industry.)

Controls: A glance at Table 28 will reveal that outside of general ventilation few control measures were instituted.

TABLE 27—CLOTHING AND ALLIED INDUSTRY

| MATERIAL | NUMBER AND PERCENT OF WORKERS IN EACH SUB GROUP EXPOSED TO SPECIFIED MATERIAL | | | | | | | | | | | |
|----------------------------------|---|-------|--------|-------|------------------------|-------|-------|-------|------------------|-------|---------------------------|-------|
| | Total | | Gloves | | Shirts collar and cuff | | Suits | | Women's clothing | | Other clothing (N. O. S.) | |
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| TOTAL NUMBER WORKERS EMPLOYED.. | 17,456 | ..... | 1,939 | 11.1 | 1,330 | 7.6 | 7,583 | 43.5 | 3,108 | 17.8 | 3,496 | 20.0 |
| Organic dusts..... | 2,548 | 14.6 | 312 | 16.1 | 67 | 5.0 | 1,683 | 22.2 | 62 | 2.0 | 424 | 12.1 |
| High humidity..... | 1,083 | 6.2 | 117 | 6.0 | 193 | 14.5 | 265 | 3.5 | 125 | 4.0 | 383 | 11.0 |
| Petroleum products..... | 133 | 0.8 | 16 | 0.8 | 11 | 0.8 | 42 | 0.6 | 18 | 0.6 | 46 | 1.3 |
| Silicate dusts..... | 100 | 0.6 | 6 | 0.3 | 8 | 0.6 | 35 | 0.5 | 11 | 0.4 | 40 | 1.1 |
| Dermatitis producers..... | 99 | 0.6 | ..... | ..... | 1 | * | 49 | 0.6 | 44 | 1.4 | 5 | 0.1 |
| Mercury..... | 90 | 0.5 | ..... | ..... | ..... | ..... | 90 | 1.2 | ..... | ..... | ..... | ..... |
| Carbon monoxide..... | 67 | 0.4 | 6 | 0.3 | 3 | 0.2 | 18 | 0.2 | 17 | 0.5 | 23 | 0.7 |
| Bituminous coal dust..... | 59 | 0.3 | 7 | 0.4 | 6 | 0.5 | 18 | 0.2 | 8 | 0.3 | 20 | 0.6 |
| Metals (N. O. S.)..... | 58 | 0.3 | 12 | 0.6 | 5 | 0.4 | 26 | 0.3 | 7 | 0.2 | 8 | 0.2 |
| Organic solvents..... | 48 | 0.3 | 7 | 0.4 | ..... | ..... | 6 | * | 1 | * | 34 | 1.0 |
| Sulphur dioxide..... | 42 | 0.2 | 6 | 0.3 | 3 | 0.2 | 11 | 0.1 | 4 | 0.1 | 18 | 0.5 |
| Ink..... | 29 | 0.2 | 8 | 0.4 | 2 | 0.2 | 7 | * | 3 | * | 9 | 0.3 |
| Alkalies..... | 27 | 0.2 | ..... | ..... | 1 | * | 10 | 0.1 | ..... | ..... | 16 | 0.5 |
| Gases (N. O. S.)..... | 23 | 0.1 | ..... | ..... | 1 | * | 4 | * | 17 | 0.5 | 1 | * |
| Non-siliceous dusts..... | 22 | 0.1 | 12 | 0.6 | 1 | * | 5 | * | 3 | * | 1 | * |
| Dyes..... | 22 | 0.1 | ..... | ..... | ..... | ..... | 1 | * | ..... | ..... | 21 | 0.6 |
| Infections..... | 16 | * | ..... | ..... | ..... | ..... | ..... | ..... | 16 | 0.5 | ..... | ..... |
| Extreme temperature changes..... | 11 | * | ..... | ..... | ..... | ..... | 3 | * | 8 | 0.3 | ..... | ..... |
| Alcohols, esters and ethers..... | 10 | * | ..... | ..... | ..... | ..... | 4 | * | ..... | ..... | 6 | 0.2 |
| Chlorine..... | 9 | * | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 9 | 0.3 |
| Mineral acids..... | 9 | * | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 9 | 0.3 |
| Lead..... | 7 | * | ..... | ..... | ..... | ..... | 5 | * | 1 | * | 1 | * |
| Aniline..... | 7 | * | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 7 | 0.2 |
| Organic acids..... | 6 | * | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 6 | 0.2 |
| Silica dust..... | 4 | * | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 4 | 0.1 |
| Halogenated hydrocarbons..... | 4 | * | 2 | 0.1 | ..... | ..... | ..... | ..... | 2 | * | ..... | ..... |
| Chemicals (N. O. S.)..... | 3 | * | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3 | * |
| Salts..... | 3 | * | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3 | * |
| Paints..... | 2 | * | ..... | ..... | ..... | ..... | 2 | * | ..... | ..... | ..... | ..... |
| Medicinals..... | 2 | * | ..... | ..... | ..... | ..... | 1 | * | ..... | ..... | 1 | * |
| Antimony..... | 1 | * | ..... | ..... | ..... | ..... | ..... | ..... | 1 | * | ..... | ..... |
| Aldehydes..... | 1 | * | 1 | * | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

*Less than 0.1%
(N. O. S.) Not otherwise specified.

TABLE 28—CLOTHING AND ALLIED—CONTROLS
100 Plants—17,456 Employees

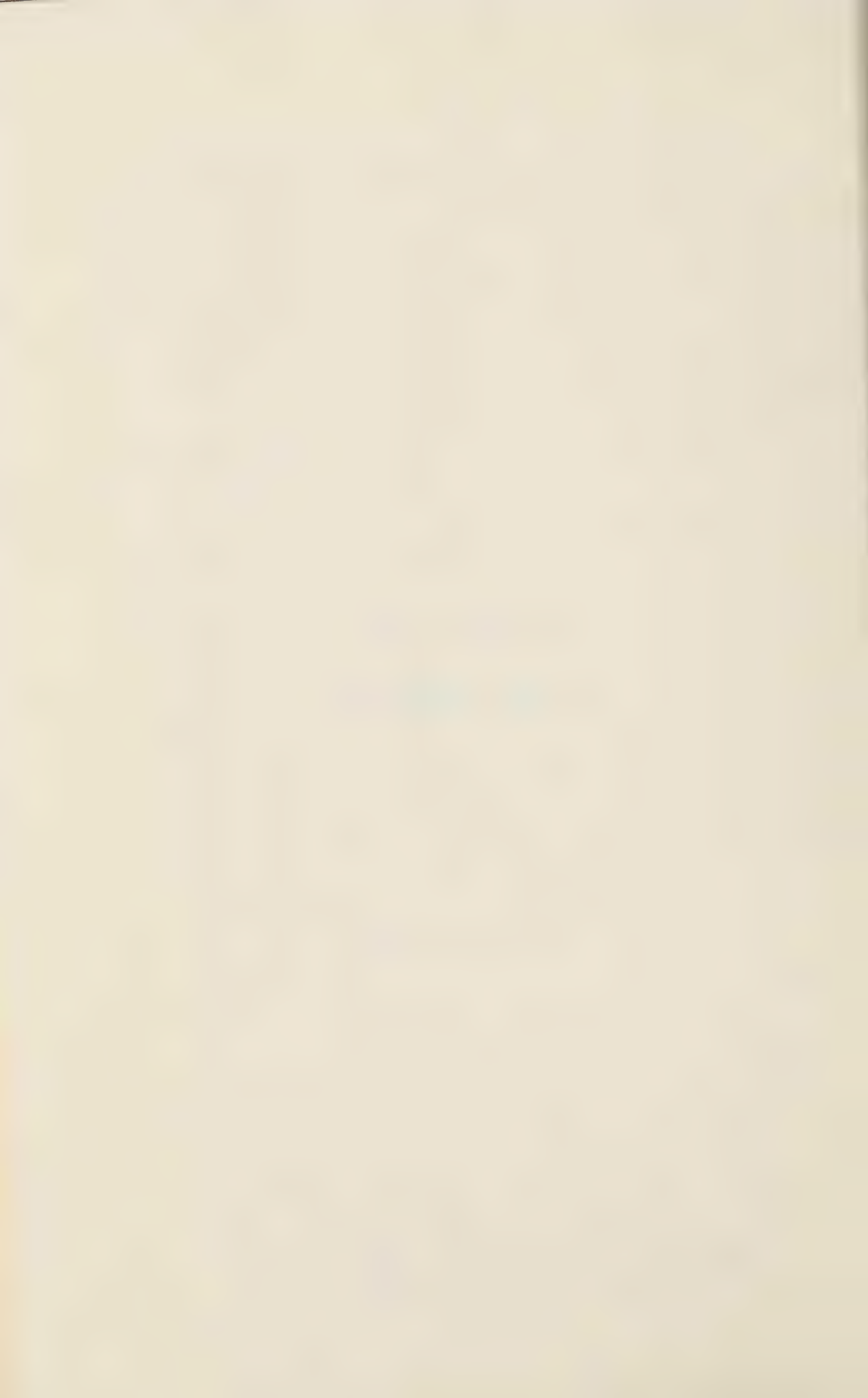
| MATERIAL | Number of workers exposed | PERCENT OF EXPOSED WORKERS HAVING INDICATED TYPE OF CONTROL | | | | | | | | | | Percent of exposed workers having one or more controls |
|----------------------------------|---------------------------|---|----------|---------------|------------------|------------|----------|---------------|--------------|---------------------|---------------------|--|
| | | General ventilation | | Local exhaust | Enclosed process | Wet method | Gas mask | Respirator | | Air line respirator | Protective clothing | Other |
| | | Positive | Negative | | | | | Approved type | Not approved | | | |
| Organic dusts..... | 2,548 | 9.7 | 31.4 | 0.4 | 0.4 | 0.4 | | | | | | 32.8 |
| High humidity..... | 1,083 | 0.9 | 13.4 | 2.9 | 0.6 | | | | | | | 15.9 |
| Petroleum products..... | 133 | | | | | | | | | | | |
| Silicate dusts..... | 100 | 2.0 | 9.0 | | | | | | 2.0 | | | 11.0 |
| Dermatitis producers..... | 99 | | | | | | | | | | | |
| Mercury..... | 90 | 100.0 | | | | | | | | | | 100.0 |
| Carbon monoxide..... | 67 | 7.5 | | | 6.0 | | | | | | | 13.4 |
| Bituminous coal dust..... | 59 | | | | | | | | | | | |
| Metals (N. O. S.)..... | 58 | 3.5 | 15.5 | | | 3.5 | | | | | | 19.0 |
| Organic solvents..... | 48 | | 10.4 | | | | | | | | | 10.4 |
| Sulphur dioxide..... | 42 | | | | 7.1 | | | | | | | 7.1 |
| Inks..... | 29 | | 17.2 | | | | | | | | | 17.2 |
| Alkalis..... | 27 | | | | | | | | | | | |
| Gases (N. O. S.)..... | 23 | | 21.7 | | | | | | | | | 21.7 |
| Non-siliceous dusts..... | 22 | | 4.5 | | | | | | | | | 4.5 |
| Dyes..... | 22 | | | 27.3 | 27.3 | | | | | | | 27.3 |
| Infections..... | 16 | | | | | | | | | | | |
| Extreme temperature changes..... | 11 | | | | | | | | | | | |
| Alcohols, esters and ethers..... | 10 | 40.0 | | | | | | | | | | 40.0 |
| Chlorine..... | 9 | | | 100.0 | | | | | | | | 100.0 |
| Mineral acids..... | 9 | | | | | | | | | | | |
| Lead..... | 7 | | | | | | | | | | | |
| Aniline..... | 7 | 85.7 | 85.7 | | | | | | | | | 85.7 |
| Organic acids..... | 6 | | 100.0 | | | | | | | | | 100.0 |
| Silica dust..... | 4 | | | 75.0 | | | | | | | | 75.0 |
| Halogated hydrocarbons..... | 4 | | | | | | | | | | | |
| Chemicals (N. O. S.)..... | 3 | | 50.0 | | | | | | | | | 50.0 |
| Salts (N. O. S.)..... | 3 | | 66.7 | | | | | | | | | 66.7 |
| Paints..... | 3 | | | | | | | | | | | |
| Medicinals..... | 2 | | | | | | | | | | | |
| Antimony..... | 1 | | | | | | | | | | | |
| Aldehydes..... | 1 | | | | | | | | | | | |

(N. O. S.) Not otherwise specified.

•

FOOD AND
ALLIED INDUSTRY

•



Food and Allied Industry

Exposures: The importance of these industries in Indiana was realized, especially the tomato canning industry, and consequently 35,464 workers were studied. This group, for the industry as a whole was exposed to 34 of the 51 major groups. The most outstanding exposures being dermatitis producers, high humidity, organic dusts, extreme temperature changes, gases (N.O.S.), alkalis, and carbon monoxide. The factor of dermatitis producers is the major problem in all sub-groups except the flour and grain industries, ice manufacture, spices and coffee, and beverages. Thirty-two and seven-tenths per cent of all the workers were potentially being exposed to some type of dermatitis producer. The canning industry, which contributed mostly to the population of this group, as well as exposures, is a highly seasonal industry. (See Table 29 for detailed study.)

Controls: Of the 32% potentially being exposed to dermatitis producers only 6.3% had some type of protective clothing and 0.3% had some other type of protection, usually some bland ointments. Controls provided for the materials are listed in Table 30.

Canning Industry; Occupational Analysis: Dermatitis and high humidity appear to be the two major problems of this industry. Both exposures appear to be concentrated in the occupations of tomato peelers, hand packers, sorters, trimmers and cutters, soakers, and cookers. The industry shows 14 of the 51 material exposures as potentially occurring. (See Table 31 for additional data.)

Slaughter and Packing Industry: Table 32 presents the major material exposures for the industry as well as the occupations where the exposures tend to occur. Dermatitis, infections, high humidity, and temperature changes appear to be the outstanding problems. Table 32 gives the rest of the analysis by occupations.

TABLE 29—FOOD AND ALLIED

| MATERIAL | NUMBER AND PERCENT OF WORKERS IN EACH SUB GROUP EXPOSED TO SPECIFIED MATERIALS | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------------|--|------|----------|------|----------------|------|-------|------|-----------------|------|-----------------------------|------|-----------------------|------|-------------------|------|-------------------|------|------------------------|------|-------------------------|------|---------------------|------|
| | Total | | Bakeries | | Dairy products | | Candy | | Flour and grain | | Fruit and vegetable canning | | Slaughter and packing | | Ice manufacturing | | Spices and coffee | | Other foods (N. O. S.) | | Non-alcoholic beverages | | Alcoholic beverages | |
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| TOTAL NO. WORKERS EMPLOYED | 35,464 | | 3,566 | 10.1 | 3,292 | 9.3 | 867 | 2.4 | 1,556 | 4.4 | 15,378 | 43.2 | 3,221 | 9.1 | 688 | 1.9 | 349 | 1.0 | 2,515 | 7.1 | 627 | 1.8 | 3,425 | 9.7 |
| Dermatitis producers..... | 11,601 | 32.7 | 970 | 27.2 | 524 | 15.9 | 449 | 51.8 | 28 | 1.8 | 7,212 | 46.9 | 1,276 | 39.7 | 18 | 2.7 | 16 | 4.6 | 491 | 19.5 | 87 | 13.9 | 530 | 15.3 |
| High humidity..... | 6,102 | 17.2 | 44 | 1.2 | 470 | 14.6 | 15 | 1.7 | 8 | 0.5 | 4,008 | 26.1 | 621 | 19.3 | 4 | 0.6 | 5 | 1.4 | 363 | 14.4 | 31 | 4.9 | 524 | 15.3 |
| Organic dusts..... | 2,164 | 6.1 | 460 | 12.9 | 20 | 0.6 | 44 | 5.1 | 694 | 44.6 | 161 | 1.0 | 36 | 1.1 | 1 | 0.1 | 52 | 14.9 | 364 | 14.5 | 2 | 0.3 | 327 | 9.3 |
| Extreme temperature changes..... | 1,831 | 5.2 | 359 | 10.1 | 243 | 7.4 | 22 | 2.5 | 13 | 0.8 | 48 | 0.3 | 617 | 19.2 | 162 | 24.3 | 3 | 0.9 | 71 | 2.8 | 8 | 1.3 | 285 | 8.3 |
| Gases (N. O. S.)..... | 1,550 | 4.4 | 330 | 9.3 | 63 | 1.9 | 8 | 0.9 | 11 | 0.7 | 79 | 0.5 | 156 | 4.8 | 53 | 7.9 | 15 | 4.3 | 84 | 3.3 | 90 | 14.4 | 661 | 19.3 |
| Alkalis..... | 1,033 | 2.9 | 20 | 0.6 | 309 | 9.4 | 1 | 0.1 | 3 | 0.2 | 17 | 0.1 | 14 | 0.4 | 2 | 0.3 | 5 | 1.4 | 9 | 0.3 | 76 | 12.1 | 577 | 16.8 |
| Carbon monoxide..... | 1,028 | 3.0 | 284 | 8.0 | 191 | 5.8 | 10 | 1.2 | 46 | 3.0 | 163 | 1.1 | 111 | 3.4 | 42 | 6.3 | 14 | 4.0 | 39 | 1.6 | 60 | 9.6 | 68 | 2.0 |
| Petroleum products..... | 1,879 | 5.3 | 144 | 4.0 | 114 | 3.5 | 10 | 1.2 | 73 | 4.7 | 124 | 0.8 | 105 | 3.3 | 67 | 10.0 | 4 | 1.1 | 70 | 2.8 | 8 | 1.3 | 160 | 4.7 |
| Infections..... | 795 | 2.2 | | | 12 | 0.4 | | | | | 23 | 0.1 | 734 | 22.8 | | | | | 5 | 0.2 | 1 | 0.2 | 20 | 0.6 |
| Silicate dusts..... | 688 | 1.9 | 62 | 1.7 | 106 | 3.2 | 9 | 1.0 | 40 | 2.6 | 196 | 1.3 | 65 | 2.0 | 50 | 7.5 | 5 | 1.4 | 42 | 1.7 | 13 | 2.1 | 100 | 2.9 |
| Bituminous coal dust..... | 686 | 1.9 | 50 | 1.4 | 117 | 3.6 | 10 | 1.2 | 50 | 3.2 | 194 | 1.3 | 71 | 2.2 | 71 | 10.6 | 2 | 0.6 | 38 | 1.5 | 14 | 2.2 | 69 | 2.0 |
| Sulphur dioxide..... | 483 | 1.4 | 27 | 0.8 | 106 | 3.2 | 8 | 0.9 | 40 | 2.6 | 124 | 0.8 | 57 | 1.8 | 26 | 3.9 | 2 | 0.6 | 31 | 1.2 | 8 | 1.3 | 54 | 1.6 |
| Metals (N. O. S.)..... | 399 | 1.1 | 15 | 0.4 | 29 | 0.9 | 7 | 0.8 | 13 | 0.8 | 114 | 0.7 | 25 | 0.8 | 15 | 2.2 | 10 | 2.9 | 75 | 3.0 | 1 | 0.2 | 95 | 2.8 |
| Oils (not petroleum)..... | 303 | 0.9 | 129 | 3.6 | | | 31 | 3.6 | 33 | 2.1 | | | 38 | 1.2 | 2 | 0.3 | 11 | 3.2 | 46 | 1.8 | 2 | 0.3 | 11 | 0.3 |
| Alcohols, esters and ethers..... | 224 | 0.6 | | | 5 | 0.2 | | | | | 3 | | | | | | | | 12 | 0.5 | | | 196 | 5.7 |
| Organic solvents..... | 188 | 0.5 | 9 | 0.3 | 1 | | 11 | 1.3 | 9 | 0.6 | 66 | 0.4 | 13 | 0.4 | 12 | 1.8 | 8 | 2.3 | 12 | 0.4 | 5 | 0.8 | 39 | 1.1 |
| Chemicals (N. O. S.)..... | 180 | 0.5 | 1 | | 18 | 0.5 | | | 19 | 1.2 | 33 | 0.2 | 3 | | 3 | 0.4 | 1 | 0.3 | 68 | 2.7 | 1 | 0.2 | 36 | 1.1 |
| Non-siliceous dusts..... | 161 | 0.5 | | | 8 | 0.2 | | | 10 | 0.6 | 74 | 0.5 | 10 | 0.3 | 16 | 2.4 | 15 | 4.3 | 19 | 0.8 | | | 9 | 0.3 |
| Salts (N. O. S.)..... | 161 | 0.5 | 11 | 0.3 | 13 | 0.4 | | | 6 | 0.4 | 71 | 0.5 | 5 | 0.2 | 18 | 2.7 | 15 | 4.3 | 8 | 0.3 | 3 | 0.5 | 11 | 0.3 |
| Inks..... | 137 | 0.4 | | | | | 10 | 1.2 | 8 | 0.5 | 103 | 0.7 | 2 | | | | 6 | 1.7 | | | | | | |
| Mineral acids..... | 118 | 0.3 | | | 73 | 2.2 | | | 6 | 0.4 | 5 | | 2 | | 1 | 0.1 | | | 21 | 0.8 | 5 | 0.8 | 5 | 0.1 |
| Lead..... | 112 | 0.3 | 4 | 0.1 | 18 | 0.5 | | | 12 | 0.8 | 27 | 0.2 | 1 | | 4 | 0.6 | 4 | 1.1 | 29 | 1.2 | 4 | 0.6 | 9 | 0.3 |
| Aldehydes..... | 93 | 0.3 | 52 | 1.5 | | | 2 | 0.2 | | | | | 33 | 1.0 | | | | | 6 | 0.2 | 2 | 0.3 | 4 | 0.1 |
| Organic acids..... | 66 | 0.2 | 5 | 0.1 | 8 | 0.2 | | | 2 | 0.1 | 29 | 0.2 | 3 | | 2 | 0.3 | | | 12 | 0.5 | 2 | 0.3 | | |
| Coal tar products..... | 54 | 0.2 | | | | | | | 1 | | 22 | 0.1 | 1 | | | | 5 | 1.4 | 20 | 0.8 | 5 | 0.8 | 46 | 1.3 |
| Chlorine..... | 53 | 0.1 | | | | | | | | | | | 1 | | | | | | 3 | 0.1 | 6 | 1.0 | 2 | * |
| Medicinals..... | 49 | 0.1 | | | 10 | 0.3 | | | 21 | 1.3 | 2 | * | 1 | | | | 5 | 1.4 | 18 | 0.7 | 2 | * | | |
| Dyes..... | 29 | | | | | | | | | | 8 | * | 1 | | | | | | 10 | 0.4 | | | | |
| Lacquers..... | 17 | * | | | 1 | * | | | | | | | 1 | | | | 5 | 1.4 | | | | | 1 | * |
| Silica dust..... | 11 | * | 2 | * | 3 | * | | | | | 3 | * | | | 2 | 0.3 | | | | | | | | |
| Antimony..... | 10 | * | | | 1 | * | | | | | 7 | * | | | | | | | 3 | 0.1 | | | 9 | 0.3 |
| Halogenated hydrocarbons..... | 4 | * | | | | * | | | | | | | | | | | | | 3 | 0.1 | | | | |
| Sulphur..... | 1 | * | | | 1 | * | | | 1 | * | | | | | | | | | | | | | | |
| Asbestos dust..... | 1 | * | | | | | | | | | | | | | | | | | 1 | * | | | | |

*Less than 0.1% (N. O. S.) Not otherwise specified.

TABLE 30—FOOD AND ALLIED—CONTROLS
535 Plants—35,464 Employees

| MATERIAL | Number of workers exposed | PERCENT OF EXPOSED WORKERS HAVING INDICATED TYPE OF CONTROL | | | | | | | | | | Percent of exposed workers having one or more controls |
|----------------------------------|---------------------------|---|----------|---------------|------------------|------------|----------|---------------|--------------|---------------------|---------------------|--|
| | | General ventilation | | Local exhaust | Enclosed process | Wet method | Gas mask | Respirator | | Air line respirator | Protective clothing | Other |
| | | Positive | Negative | | | | | Approved type | Not approved | | | |
| Dermatitis producers..... | 11,601 | | | | | | | | | | | |
| High humidity..... | 6,102 | 1.4 | 4.3 | 1.7 | 2.0 | | | | | | 6.2 | 0.3 |
| Organic dusts..... | 2,164 | 1.1 | 9.2 | 15.0 | 16.2 | 0.9 | | 1.3 | 2.7 | | | 0.6 |
| Extreme temperature changes..... | 1,831 | 0.2 | 0.2 | 2.3 | | | | | | | 11.2 | |
| Gases (N. O. S.)..... | 1,850 | 1.0 | 7.4 | 8.6 | 6.2 | | 1.2 | | 1.1 | | | |
| Alkalis..... | 1,633 | | 1.5 | | 0.4 | | | | | | 3.2 | 0.3 |
| Carbon monoxide..... | 1,028 | 0.9 | 1.5 | 4.9 | 4.0 | | | | 0.4 | | | 10.5 |
| Petroleum products..... | 879 | | | | | | | | | | 0.1 | |
| Infectious..... | 795 | | | | | | | | | | | |
| Silicate dusts..... | 683 | | 0.6 | 1.2 | | 1.6 | | | 0.4 | | | |
| Bituminous coal dust..... | 686 | | 0.9 | 0.1 | 1.2 | | | | 0.4 | | | |
| Sulphur dioxide..... | 483 | | 0.2 | | 3.7 | | | | | | | |
| Metals (N. O. S.)..... | 399 | 2.0 | 0.3 | 7.3 | 0.5 | 6.5 | | | | | | 10.3 |
| Oil (not petroleum)..... | 303 | | | 1.3 | | | | | 0.7 | 0.7 | | |
| Alcohols, esters and ethers..... | 224 | 2.2 | 11.2 | | 1.3 | | | | | | | 2.0 |
| Organic solvents..... | 188 | 20.2 | 3.7 | 1.1 | 2.1 | | | | 14.4 | 1.1 | | 12.5 |
| Chemicals (N. O. S.)..... | 180 | | | | | | | | | | | 41.5 |
| Non-siliceous dusts..... | 161 | | | 9.3 | 2.5 | 10.6 | | | | | | 13.0 |
| Salts (N. O. S.)..... | 161 | | | 0.6 | 0.6 | | | | | | | 1.2 |
| Inks..... | 137 | 33.6 | 1.5 | 5.8 | | | | | | | | 35.0 |
| Mineral acids..... | 118 | | 0.9 | | | | | | | | 1.7 | 2.5 |
| Lead..... | 112 | 5.4 | | 1.8 | | | | | 1.8 | | | 5.1 |
| Aldehydes..... | 93 | | 2.2 | 10.8 | 10.8 | | | | | | | 7.1 |
| Paints..... | 66 | | | 3.0 | | | | | 42.4 | 1.5 | | 22.6 |
| Organic acids..... | 54 | | | 1.9 | | | | | | | | 43.9 |
| Coal tar products..... | 53 | | | | | | | | | | | 1.9 |
| Chlorine..... | 49 | 6.1 | 18.4 | 26.5 | 12.2 | | 12.2 | | 2.0 | | | 59.2 |
| Medicinals..... | 29 | | | | | | | | | | | |
| Dyes..... | 17 | | | | | | | | | | | |
| Lacquers..... | 11 | 27.3 | | 27.3 | | | | | | | | 72.7 |
| Silica dust..... | 10 | | | 60.0 | | | | | 27.3 | 18.2 | | 60.0 |
| Antimony..... | 10 | 60.0 | | | | | | | | | | 60.0 |
| Halogenated hydrocarbons..... | 4 | | | | | | | | | | | |
| Sulphur..... | 1 | | | | | | | | | | | |
| Asbestos dust..... | 1 | | | | | | | | | | | |

*Less than 0.1%
(N. O. S.) Not otherwise specified.

TABLE 31—FRUIT AND VEGETABLE CANNING INDUSTRY¹
MATERIAL EXPOSURE BY OCCUPATION

Survey Data: 107 Plants; 15,378 Employees; 9,389 Employees were given 12,916 Exposures

| OCCUPATION | NUMBER OF PERSONS EXPOSED TO SPECIFIED MATERIALS BY OCCUPATION | | | | | | | | | | | | | | | |
|--|--|---------------|----------------|----------------------|-----------------|---------------|--------------------|-----------------|-------------------|------|------------------|---------------------|------------------|------------------|-----------------------------|--------------------------------------|
| | Dermatitis producers | High humidity | Silicate dusts | Bituminous coal dust | Carbon monoxide | Organic dusts | Petroleum products | Sulphur dioxide | Metals (N. O. S.) | Inks | Gases (N. O. S.) | Non-siliceous dusts | Salts (N. O. S.) | Organic solvents | Extreme temperature changes | Miscellaneous ² materials |
| TOTAL NUMBER OF WORKERS EXPOSED . . . | 7,212 | 4,008 | 196 | 194 | 163 | 161 | 124 | 124 | 114 | 103 | 79 | 74 | 71 | 66 | 48 | 179 |
| Tomato peelers | 3,814 | 1,557 | | | | | | | | | | | | | | |
| Can fillers, packers (hand) | 724 | 395 | | | | | | | | | | | | | | |
| Sorters | 721 | 363 | | | | 35 | | | | | | | | | | |
| Trimmers and cutters | 663 | 308 | | | | 19 | | | | | | | | | | |
| Bean stringers, soakers, blanchers | 267 | 22 | | | | | | | | | | | | | 5 | |
| Warehousemen (labellers, casers, shippers, etc.) | 191 | 19 | 8 | | | | | | | 53 | | | | | | |
| Kettle cookers, coil cleaners | 150 | 260 | | | 2 | | | | | | 4 | 1 | 24 | | 2 | |
| Vegetable dicers, scrapers | 80 | | | | | | | | | | | | | | | |
| Cutting machine operators | 78 | 12 | | | | | | | | | | | | | | |
| Corn cutters, huskers (hand) | 48 | 164 | | | | 77 | | | | | | | | | | |
| Pork cutters, droppers | 42 | 2 | | | | | | | | | | | | | | |
| Cabbage shuckers, cutters | 42 | | | | | | | | | | | | | | | |
| Corn husking machine operators | 36 | | | | | | | | | | | | | | | |
| Juice extractor, mixer, pre-heater | 33 | 44 | | | | | | | | | | | | | | |
| Pimento seeder, washers | 29 | | | | | | | | | | | | | | | |
| Tomato feeders, carriers | 26 | 61 | | | | | | | | | | | | | | |
| Receivers, unloaders, dumpers | 21 | 41 | | | | | | | | | | | 10 | | 20 | |
| Washer operators | 20 | 49 | | | | | | | | | | | | | | |
| Salters, brine mixers | 20 | 6 | | | | | | | | | | | 28 | | | |
| Pulp haulers, sloop men | 19 | 16 | | | | | | | | | | | | | | |
| Kraut makers | 19 | 19 | | | | | | | | | | | | | | |
| Can strappers, catchers, ring pullers | 16 | 227 | | | | | | | | | | | | | | |
| Machinists, mechanics, maintenance men | 15 | 4 | 5 | | 12 | | 83 | 1 | 84 | | 20 | 62 | | 25 | | 3 |
| Electricians | 12 | | | | | | | | 2 | | | 2 | | | | |
| Pickle men | 12 | | | | | | | | | | | | 3 | | | |
| Syrup mixers, makers | 9 | 9 | | | | | | | | | | | | | 2 | |
| General laborers, clean-up men | 7 | 4 | 3 | 10 | 1 | 6 | | | | | 1 | | | | | |
| Can filler, capper, closer operators | 3 | 127 | | | | | 8 | | | | 1 | 1 | | | | |
| Engineers and helpers | 3 | | | | | | 2 | | 1 | | 18 | 1 | | | | |
| Retort cookers, processors | | 160 | | | | | | | | | | | | | 7 | |
| Firemen and helpers (coal and ash haulers) | | 1 | 162 | 181 | 139 | | 3 | 123 | | | 23 | | 2 | | 2 | |
| Pipe-fitters, plumbers, helpers | | | 13 | | 2 | 13 | 15 | | 2 | | 2 | | | | | |
| Knife sharpeners | | | 5 | | | | | | 7 | | | 6 | | | | |
| Printers, press operators, type setters | | | | | | | | | | 4 | | | | 41 | | |
| Welders | | | | | 7 | | | | 6 | | 6 | | | | | |
| Miscellaneous | 92 | 138 | | 3 | | 11 | 13 | | 12 | 8 | 4 | 2 | 4 | | 7 | 179 |

¹Survey was conducted mostly during tomato canning season. Main types of plants are tomatoes, tomato products, corn and green beans. There are also a few plants canning pork and beans, hominy, pimento, pickles, beets and miscellaneous vegetables and fruits. Pumpkins were not being canned during survey.

²Next material is less than 0.3% of total number of exposures.
(N. O. S.) Not otherwise specified.

TABLE 32—SLAUGHTER AND PACKING HOUSES¹
MATERIAL EXPOSURE BY OCCUPATION

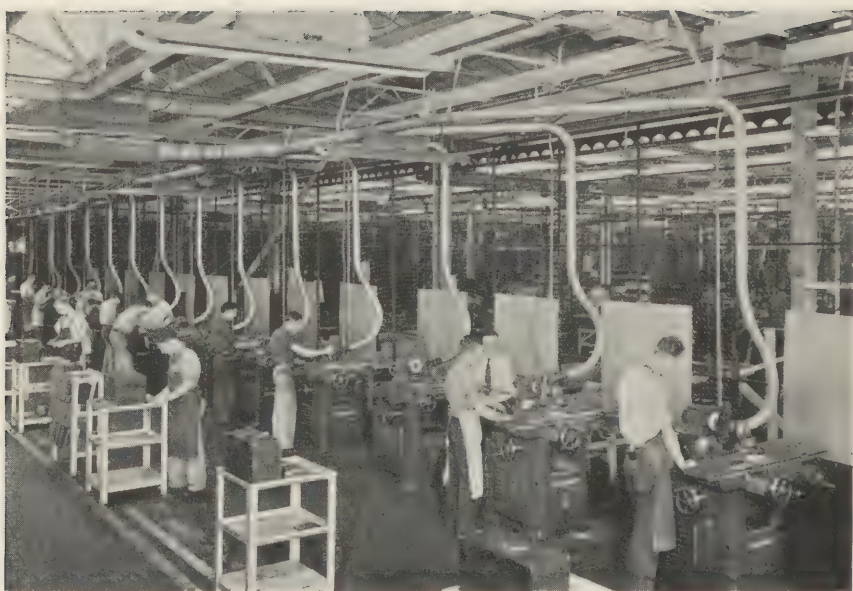
Survey Data: 39 Plants; 3,221 Employees; 2,090 Employees were given 3,998 Exposures

| OCCUPATION | NUMBER OF WORKERS EXPOSED TO SPECIFIED MATERIALS BY OCCUPATION | | | | | | | | | | | | | |
|--|--|------------|---------------|-----------------------------|------------------|-----------------|--------------------|----------------------|----------------|-----------------|----------------------|---------------|-----------|-------------------|
| | Dermatitis producers | Infections | High humidity | Extreme temperature changes | Gases (N. O. S.) | Carbon monoxide | Petroleum products | Bituminous coal dust | Silicate dusts | Sulphur dioxide | Oils (not petroleum) | Organic dusts | Aldehydes | Metals (N. O. S.) |
| TOTAL NUMBER OF WORKERS EXPOSED..... | 1,276 | 734 | 621 | 617 | 156 | 111 | 105 | 71 | 65 | 57 | 38 | 36 | 33 | 25 |
| Butchers (also do some killing)..... | 274 | 296 | 204 | 115 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Stuffers and linkers..... | 150 | 17 | 41 | 8 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Cutters and trimmers..... | 127 | 100 | 3 | 94 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Sausage choppers and mixers, meat grinders.... | 114 | 56 | 1 | 9 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Casing men, sausage stuffers..... | 90 | 5 | 6 | 22 | 2 | ... | ... | ... | ... | ... | ... | 3 | ... | ... |
| Stickers, killers..... | 64 | 62 | 63 | 22 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Curers, smokers..... | 62 | 2 | 2 | 4 | 87 | 20 | ... | ... | ... | ... | ... | 6 | ... | ... |
| Packers, wrappers..... | 45 | ... | ... | 109 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Poultry dressers, feather pickers..... | 42 | 39 | 32 | ... | ... | ... | ... | ... | ... | 17 | ... | 9 | 9 | ... |
| Meat washers and cleaners..... | 39 | 9 | 7 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Casing cleaners, flushers..... | 35 | 12 | 35 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Meat slicers..... | 34 | ... | 4 | 8 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Beef and ham boners..... | 27 | 25 | 5 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Head cutters, carcass splitters..... | 23 | 2 | 23 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Shavers, scrapers, dehairers..... | 20 | 23 | 49 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Skinners..... | 17 | 15 | 10 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Picklers, salters..... | 17 | 9 | ... | 8 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Viscerators, gutters..... | 14 | 15 | 14 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Truck and floor washers..... | 12 | ... | 9 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Meat hangers, truckers..... | 10 | 2 | 5 | 48 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Lard renderers and packers..... | 9 | ... | 9 | 13 | ... | ... | ... | 1 | ... | ... | 12 | ... | 14 | ... |
| Offal workers..... | 9 | 9 | 10 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Storage men, order fillers..... | 7 | ... | ... | 78 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Butter churners, cutters and wrappers..... | 6 | ... | 1 | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Soakers and drainers..... | 4 | ... | 5 | 3 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Cookers..... | 2 | ... | 22 | 4 | 19 | 7 | ... | ... | ... | ... | ... | ... | 4 | ... |
| Tankage men..... | 1 | 7 | 17 | 9 | 4 | ... | ... | ... | ... | 7 | ... | ... | 6 | ... |
| Yard men, stock receivers..... | ... | 17 | ... | ... | ... | ... | ... | ... | ... | ... | ... | 11 | ... | ... |
| Mechanics, maintenance men..... | ... | ... | ... | 17 | 11 | 22 | 75 | 1 | ... | ... | ... | 1 | ... | 23 |
| Ice makers..... | ... | ... | ... | 10 | 5 | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Stationery engineers and firemen..... | ... | ... | 4 | 8 | 22 | 60 | 29 | 68 | 63 | 57 | ... | ... | ... | ... |
| Miscellaneous..... | 22 | 12 | 40 | 27 | 6 | 2 | 1 | 1 | 2 | ... | 2 | 6 | ... | 2 |
| | | | | | | | | | | | | | | 53 |

¹This industry includes meat slaughtering and packing and poultry dressing.

*The next largest material is less than 0.4% of the total number of exposures.
(N. O. S.) Not otherwise specified.

•
IRON AND STEEL
•



Controlled grinding operations in one of the large plants. Note local exhausting of all wheels and good "housekeeping."

Iron and Steel

This was the largest industrial group studied, totaling 80,728 workers. The sub-groups indicated on Table 33 comprise the various constituents of this industry. Blast furnaces and steel rolling mills make up the largest single sub-group, accounting for 17,300 of the surveyed 80,728 persons.

Exposures: For the industry as a whole the leading major exposures were to metals (N.O.S.), dermatitis producers, silica dust, and extreme temperature changes. Exposure to metals were predominant in practically every sub-group, while dermatitis producers seemed to be concentrated in the aircraft works, possibly due to the vast amount of machining done in this industry. Exposures to silica dust were predominantly in the foundries. Extreme temperature changes were encountered in the blast furnaces and steel rolling mills chiefly. It was in this same industry that Bloomfield⁴ of the United States Public Health Service, discovered that the pneumonia rate was higher than for any other industrial group.

Controls: Table 34 indicates that 35.7% of workers exposed to metals (N.O.S.) had some type of control. Thirty-seven and two-tenths per cent of workers exposed to silica dust had control measures instituted. Other exposures and controls are listed in Table 34.

Blast Furnaces and Steel Rolling Mills; Occupational Analysis: The chief exposures for this industry as well as the occupations where these exposures tend to occur, are listed in Table 35. In summary it would appear that exposures to metals (N.O.S.) lead the list and is followed by exposures to extreme temperature changes, gases, petroleum products and dermatitis producers. For example, the occupations chiefly concerned with extreme temperature changes are rollers, roughers, catchers, sticker pullers, furnace chargers, melters, tenders, heaters, tappers and blowers. This table is very useful in locating occupations where the exposures tend to occur so that preventive methods may be used at points of origin.

Iron Foundry; Occupational Analysis: Silica dust, metals (N.O.S.), extreme temperature changes and silicate dusts were the main potential exposures. Molders and molder helpers had the greatest number of potential exposures to silica. Silica dust control measures in few occupations would greatly reduce the silicosis problem in foundries.

TABLE 33—IRON AND STEEL INDUSTRY

NUMBER AND PERCENT OF WORKERS IN EACH SUB GROUP EXPOSED TO SPECIFIED MATERIALS

| MATERIAL | Total | | Agri-cultural imple-ments | | Auto-mobiles and trailers | | Wire mills | | Blast furnaces and steel rolling mills | | Car and railroad shops | | Ship and boat building | | Wagon and carriage shops | | Aircraft | | Foundries | | Machine shops | | Small machinery and cutlery | | Heavy machinery | | Other iron and steel (N. O. S.) | |
|----------------------------------|--------|-------|---------------------------|-------|---------------------------|-------|------------|-------|--|-------|------------------------|-------|------------------------|-------|--------------------------|-------|----------|-------|-----------|------|---------------|-------|-----------------------------|------|-----------------|------|---------------------------------|------|
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| TOTAL NO. ALL WORKERS..... | 80,728 | .... | 2,290 | 2.9 | 20,118 | 25.0 | 2,135 | 2.6 | 17,300 | 21.4 | 2,616 | 3.3 | 232 | 0.3 | 243 | 0.3 | 362 | 0.4 | 11,691 | 14.5 | 1,316 | 1.6 | 3,898 | 4.8 | 5,446 | 6.7 | 13,081 | 16.2 |
| Metals (N. O. S.)..... | 26,886 | 33.3 | 851 | 37.2 | 6,728 | 33.4 | 251 | 11.8 | 4,905 | 28.4 | 797 | 30.5 | 67 | 28.9 | 19 | 7.8 | 230 | 65.2 | 4,580 | 39.2 | 647 | 49.2 | 1,622 | 41.6 | 1,781 | 32.7 | 4,402 | 33.7 |
| Dermatitis producers..... | 8,354 | 10.3 | 364 | 15.3 | 2,945 | 14.6 | 73 | 3.4 | 1,021 | 5.9 | 198 | 7.5 | 2 | 0.9 | 4 | 1.6 | 171 | 47.2 | 449 | 3.8 | 388 | 29.5 | 740 | 19.0 | 602 | 11.1 | 1,457 | 11.1 |
| Silica dust..... | 6,746 | 8.4 | 181 | 7.9 | 387 | 2.9 | 4 | 0.2 | 494 | 2.9 | 89 | 3.6 | 2 | 0.9 | 21 | 8.6 | 2 | 0.6 | 4,808 | 41.1 | 28 | 2.1 | 122 | 3.1 | 164 | 3.0 | 498 | 3.8 |
| Extreme temperature changes..... | 5,013 | 6.2 | 32 | 2.3 | 819 | 4.1 | 276 | 3.6 | 3,349 | 19.4 | 156 | 6.0 | 11 | 4.7 | 21 | 8.6 | ..... | ..... | 1,202 | 10.3 | 99 | 7.5 | 350 | 9.0 | 130 | 2.4 | 927 | 7.1 |
| Petroleum products..... | 4,909 | 6.1 | 37 | 1.6 | 1,987 | 5.4 | 20 | 0.9 | 1,491 | 8.5 | 306 | 11.7 | 41 | 17.7 | 21 | 8.6 | 32 | 8.8 | 725 | 6.2 | 87 | 6.6 | 131 | 3.4 | 246 | 4.5 | 644 | 4.9 |
| Gases (N. O. S.)..... | 4,711 | 5.8 | 84 | 3.7 | 1,775 | 3.9 | 25 | 1.2 | 1,822 | 10.5 | 105 | 4.0 | 11 | 4.7 | 9 | 3.7 | 27 | 7.5 | 925 | 7.9 | 122 | 9.3 | 460 | 11.8 | 266 | 4.9 | 607 | 4.6 |
| Silicate dusts..... | 3,914 | 4.8 | 97 | 4.2 | 1,094 | 5.5 | 113 | 5.3 | 891 | 5.2 | 17 | 0.6 | 13 | 5.6 | ..... | ..... | ..... | ..... | 782 | 6.5 | 65 | 4.9 | 363 | 9.3 | 101 | 1.9 | 697 | 7.3 |
| Non-siliceous dusts..... | 3,165 | 3.9 | 56 | 2.4 | 908 | 4.5 | 44 | 2.1 | 1,000 | 5.8 | 174 | 6.7 | 13 | 5.6 | ..... | ..... | ..... | ..... | 782 | 6.5 | 65 | 4.9 | 363 | 9.3 | 101 | 1.9 | 697 | 7.3 |
| Carbon monoxide..... | 3,105 | 3.7 | 61 | 2.7 | 656 | 3.3 | 44 | 2.1 | 1,000 | 5.8 | 174 | 6.7 | 13 | 5.6 | ..... | ..... | ..... | ..... | 782 | 6.5 | 65 | 4.9 | 363 | 9.3 | 101 | 1.9 | 697 | 7.3 |
| Organic dusts..... | 1,794 | 2.2 | 127 | 5.5 | 960 | 4.8 | 122 | 5.7 | 236 | 1.4 | 94 | 3.6 | 9 | 3.9 | 109 | 44.9 | 17 | 4.7 | 610 | 5.2 | 20 | 1.5 | 149 | 3.8 | 110 | 2.0 | 462 | 3.5 |
| Lead..... | 1,144 | 1.4 | 3 | 0.1 | 399 | 2.0 | 141 | 6.6 | 271 | 1.6 | 29 | 1.1 | 7 | 3.0 | ..... | ..... | ..... | ..... | 822 | 4.4 | 18 | 1.4 | 129 | 3.3 | 198 | 1.8 | 467 | 3.6 |
| Paints..... | 1,143 | 1.4 | 52 | 2.3 | 280 | 1.4 | 14 | 0.7 | 31 | 0.2 | 54 | 2.1 | 4 | 1.7 | 10 | 4.1 | 12 | 3.3 | 160 | 1.3 | 25 | 1.9 | 74 | 1.9 | 158 | 2.9 | 262 | 2.0 |
| Oil (not petroleum)..... | 1,120 | 1.4 | 19 | 0.8 | 124 | 0.6 | 41 | 1.9 | 407 | 2.4 | 72 | 2.8 | 2 | 0.9 | 8 | 3.3 | ..... | ..... | 512 | 4.4 | 4 | 0.3 | 56 | 1.4 | 42 | 0.7 | 175 | 1.3 |
| Bituminous coal dust..... | 993 | 1.2 | 1 | ..... | 111 | 0.6 | 59 | 2.8 | 466 | 2.7 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 512 | 4.4 | 1 | ..... | 53 | 1.4 | 21 | 0.4 | 224 | 1.7 |
| Mineral acids..... | 876 | 1.1 | 19 | 0.8 | 264 | 1.3 | 5 | 0.2 | 106 | 0.6 | 36 | 1.4 | 4 | 1.7 | 4 | 1.6 | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Organic solvents..... | 860 | 1.1 | 12 | 0.1 | 116 | 0.6 | 19 | 0.9 | 70 | 0.4 | 1 | ..... | ..... | ..... | 12 | 4.9 | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| High humidity..... | 565 | 0.7 | 15 | 0.7 | 42 | 0.2 | 12 | 0.6 | 66 | 3.8 | 13 | 0.5 | 4 | 1.7 | 12 | 4.9 | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Lacquers..... | 529 | 0.7 | 116 | 0.6 | 19 | 0.9 | 70 | 0.4 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Alkalis..... | 529 | 0.7 | 116 | 0.6 | 19 | 0.9 | 70 | 0.4 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Sulphur dioxide..... | 289 | 0.3 | 16 | 0.7 | 100 | 0.5 | 39 | 1.8 | 145 | 0.8 | 25 | 1.0 | 2 | 0.9 | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Cyanides..... | 289 | 0.3 | 16 | 0.7 | 100 | 0.5 | 39 | 1.8 | 145 | 0.8 | 25 | 1.0 | 2 | 0.9 | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Chemicals (N. O. S.)..... | 189 | 0.2 | 30 | 0.1 | ..... | ..... | 6 | 0.3 | 135 | 0.8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Chromium..... | 143 | 0.2 | 130 | 0.2 | ..... | ..... | 6 | 0.3 | 135 | 0.8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Halogenated hydrocarbons..... | 120 | 0.1 | ..... | ..... | 55 | 0.3 | ..... | ..... | 20 | 0.1 | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Alcohols, esters and ethers..... | 97 | 0.1 | 6 | 0.3 | 27 | 0.1 | 11 | 0.5 | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Medicinals..... | 75 | ..... | 5 | 0.2 | 11 | ..... | 48 | 2.2 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Inks..... | 70 | ..... | 1 | ..... | ..... | ..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Asbestos dust..... | 69 | ..... | 4 | 0.2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Coal tar products..... | 69 | ..... | 4 | 0.2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Manganese..... | 59 | ..... | 5 | 0.2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Aldehydes..... | 44 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Antimony..... | 38 | ..... | 15 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Cadmium..... | 28 | ..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Sulphur..... | 27 | ..... | 13 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Dyes..... | 25 | ..... | 8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Organic acids..... | 15 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Benzene..... | 15 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Accelerators..... | 12 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Mercury..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |
| Aniline..... | 1 | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 161 | 1.4 | 13 | 1.0 | 34 | 0.9 | 46 | 0.8 | 192 | 1.5 |

*Less than 0.1%
(N. O. S.) Not otherwise specified).

TABLE 34—IRON AND STEEL INDUSTRY—CONTROLS
480 Plants—80,728 Employees

| MATERIAL | Number of workers exposed | PERCENT OF EXPOSED WORKERS HAVING INDICATED TYPE OF CONTROLS | | | | | | | | | | Percent of exposed workers having one or more controls | |
|----------------------------------|---------------------------|--|----------|---------------|------------------|------------|----------|---------------|--------------|---------------------|---------------------|--|-------|
| | | General ventilation | | Local exhaust | Enclosed process | Wet method | Gas mask | Respirator | | Air line respirator | Protective clothing | | Other |
| | | Positive | Negative | | | | | Approved type | Not approved | | | | |
| Metals (N. O. S.)..... | 26,886 | 0.7 | 3.7 | 13.1 | 1.4 | 18.3 | | 1.5 | 1.8 | 0.5 | | * | 35.7 |
| Dermatitis producers..... | 8,354 | | 6.4 | 12.8 | 3.5 | | | 6.2 | 5.0 | 1.1 | 0.5 | | 0.3 |
| Silica dust..... | 6,974 | 0.5 | 4.7 | 4.7 | 0.3 | 10.7 | | | | | 0.3 | * | 37.2 |
| Extreme temperature changes..... | 6,746 | | 2.3 | 1.8 | 0.4 | | | | | | 0.9 | 11.0 | 19.2 |
| Petroleum products..... | 5,013 | 0.4 | 4.7 | 14.9 | 1.9 | 0.4 | | 0.1 | * | | 1.1 | | 5.5 |
| Gases (N. O. S.)..... | 4,909 | 1.7 | 4.7 | 25.7 | 0.2 | 17.0 | | 4.1 | 0.3 | | | 0.1 | 21.9 |
| Silicate dusts..... | 4,711 | 0.5 | 4.4 | 25.7 | 0.2 | 13.6 | | 3.7 | 1.5 | | 0.1 | | 45.9 |
| Non-siliceous dusts..... | 3,914 | 0.7 | 2.2 | 23.2 | 7.0 | | | 5.3 | 3.5 | | 0.2 | | 49.0 |
| Carbon monoxide..... | 3,165 | 1.4 | 2.7 | 10.4 | 2.3 | | | 0.9 | * | | | * | 14.7 |
| Organic dusts..... | 3,025 | 1.1 | 3.5 | 22.6 | 0.7 | 2.2 | | 2.6 | 0.8 | | | | 30.6 |
| Lead..... | 1,794 | 1.4 | 2.5 | 15.1 | 1.1 | 0.2 | | 3.1 | 0.9 | 2.3 | 3.1 | 1.1 | 23.7 |
| Paints..... | 1,144 | 4.0 | 13.0 | 36.8 | 1.3 | | 0.3 | 8.0 | 18.0 | 0.3 | | | 60.1 |
| Oils (not petroleum)..... | 1,120 | 0.5 | 1.8 | 6.0 | 0.9 | | | | 0.4 | | | | 8.6 |
| Bituminous coal dust..... | | | * | 5.1 | 2.3 | 0.3 | | 10.5 | 4.5 | | | | 20.1 |
| Mineral acids..... | 993 | 1.0 | 8.1 | 25.2 | 0.1 | | | | 1.2 | 15.2 | 3.5 | | 49.4 |
| Organic solvents..... | 976 | 1.5 | 3.9 | 22.8 | 0.1 | | | 2.5 | 10.4 | 2.0 | | | 32.0 |
| High humidity..... | 860 | 1.7 | | 12.9 | | | | | | | | | 14.8 |
| Laqueers..... | 565 | 0.5 | 5.8 | 45.5 | | 1.1 | | 5.3 | 23.7 | 0.7 | 1.2 | 9.3 | 55.0 |
| Alkalis..... | 529 | 3.4 | 5.9 | 23.3 | | | | | | | | | 14.0 |
| Sulphur dioxide..... | 513 | | | 9.4 | 4.7 | | | | 1.8 | | | | 76.8 |
| Cyanides..... | 280 | 8.9 | 19.6 | 58.2 | 20.0 | | 2.1 | | 10.0 | | 5.7 | 0.4 | 15.0 |
| Chemicals (N. O. S.)..... | 267 | | 9.4 | 4.5 | | | | 1.1 | | | 4.2 | 9.5 | 56.6 |
| Chromium..... | 189 | | 2.6 | 49.2 | | | | | | | | 8.4 | 0.5 |
| Salts..... | 143 | | | 2.1 | 0.7 | | | | 1.7 | 2.5 | 4.2 | | 68.3 |
| Halogenated hydrocarbons..... | 120 | 8.3 | 1.7 | 48.3 | 1.7 | | | | 6.2 | | | | 18.6 |
| Alcohols, esters and ethers..... | 97 | | 2.1 | 15.5 | | | | | | | | | 2.7 |
| Medicinals..... | 75 | | | | | | | | | | | | 4.3 |
| Inks..... | 75 | 2.7 | | | | | | | | | | | 84.1 |
| Asbestos dust..... | 70 | | 1.4 | | | | | | | | | | 53.6 |
| Coal tar products..... | 69 | | 69.5 | 8.7 | 1.4 | | | 4.3 | | 1.4 | | | 44.1 |
| Manganese..... | 69 | 26.1 | | | | | | | 27.5 | | | | 15.9 |
| Aldehydes..... | 59 | | 1.7 | 42.4 | | | | | 16.9 | | | | 84.2 |
| Antimony..... | 44 | 9.1 | | 6.8 | | | | | | | | | 42.9 |
| Cadmium..... | 38 | | 7.9 | 71.1 | 2.6 | | | | | 23.7 | | | 33.3 |
| Sulphur..... | 28 | | 35.7 | 7.1 | | | | | | | | | 72.0 |
| Dyes..... | 27 | | 14.8 | 33.3 | | | | | | | | | 86.7 |
| Organic acids..... | 25 | 48.0 | 24.0 | | | | | | | | | | 83.3 |
| Benzene..... | 15 | 40.0 | | 46.7 | 6.7 | | | | 10.7 | 4.0 | | | |
| Accelerators..... | 12 | | 83.3 | | | | | | | | | | |
| Mercury..... | 4 | | | | | | | | | | | | |
| Aniline..... | 1 | | | | | | | | | | | | |

* Less than 0.1%
(N. O. S.) Not otherwise specified.

TABLE 35—BLAST FURNACES AND STEEL ROLLING MILLS (Except Wire)
MATERIAL EXPOSURE BY OCCUPATION
Survey Data: 15 Plants; 17,300 Employees; 8,720 Employees were given 18,705 Exposures

| OCCUPATION ¹ | NUMBER OF WORKERS EXPOSED TO SPECIFIED MATERIALS BY OCCUPATION | | | | | | | | | | | | | | | | | | | |
|---|--|-----------------------------|-------------------------------|--------------------|----------------------|-----------------|----------------|---------------|---------------------|-------------|---------------|----------------------|-------|---------------|----------------------|-----------------|----------------------|------------------|--------------------------------------|--|
| | Metals (N. O. S.) ² | Extreme temperature changes | Gases (N. O. S.) ² | Petroleum products | Dermatitis producers | Carbon monoxide | Silicate dusts | High humidity | Non-siliceous dusts | Silica dust | Mineral acids | Bituminous coal dust | Lead | Organic dusts | Oils (not petroleum) | Sulphur dioxide | Chemicals (N. O. S.) | Organic solvents | Miscellaneous ⁴ materials | |
| TOTAL NUMBER OF WORKERS EXPOSED..... | 4,905 | 3,349 | 1,822 | 1,491 | 1,021 | 1,000 | 891 | 666 | 646 | 494 | 466 | 407 | 271 | 236 | 214 | 145 | 135 | 106 | 440 | |
| Machine operators, machinists, millwrights..... | 768 | 51 | 63 | 668 | 368 | 21 | 102 | 48 | 80 | 8 | 52 | ..... | 3 | 21 | 127 | ..... | ..... | 70 | ..... |  |
| Rollers, roughers, catchers, pilers | 578 | 803 | 100 | 129 | 56 | 39 | ..... | 245 | ..... | ..... | ..... | ..... | 12 | 3 | 21 | 16 | ..... | ..... | ..... |  |
| Burners, welders (electric and gas)..... | 384 | ..... | 274 | 2 | ..... | 238 | 3 | ..... | 2 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Furnace, chargers, melters, tenders..... | 380 | 604 | 357 | 21 | ..... | 269 | 40 | ..... | 90 | ..... | ..... | 15 | ..... | ..... | ..... | 8 | ..... | ..... | ..... |  |
| Pipe fitters, threaders, helpers.. | 281 | 32 | 20 | 19 | 185 | 3 | ..... | 5 | ..... | ..... | 26 | ..... | 142 | 19 | 1 | ..... | ..... | 18 | ..... |  |
| Furnace heaters, blowers, heat treaters..... | 262 | 224 | 130 | 11 | ..... | 83 | 5 | ..... | ..... | ..... | ..... | 14 | ..... | 5 | ..... | 42 | ..... | ..... | ..... |  |
| Casting cleaners, chippers, tumbler..... | 260 | ..... | ..... | ..... | ..... | ..... | 107 | ..... | ..... | 108 | ..... | ..... | ..... | 6 | ..... | ..... | ..... | ..... | ..... |  |
| Grinders, buffers, polishers..... | 179 | ..... | ..... | 18 | 2 | ..... | 125 | ..... | 39 | ..... | 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Steel workers, general laborers.. | 176 | 51 | 16 | 89 | 50 | 6 | 6 | ..... | 126 | 90 | 3 | 35 | 4 | 30 | 9 | 9 | ..... | 2 | ..... |  |
| Charging machine operators and helpers..... | 163 | 131 | 137 | ..... | ..... | 14 | ..... | ..... | 6 | ..... | ..... | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Steel pourers, ladle men, furnace tappers..... | 100 | 147 | 47 | ..... | ..... | 36 | ..... | ..... | 12 | 11 | ..... | ..... | 18 | ..... | ..... | 12 | ..... | ..... | ..... |  |
| Blacksmith, forgers and helpers. | 99 | 2 | 70 | ..... | ..... | 44 | ..... | ..... | ..... | ..... | ..... | 3 | 9 | ..... | ..... | 2 | ..... | ..... | ..... |  |
| Shear men and laborers..... | 79 | 35 | ..... | 18 | ..... | 26 | 9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Pit cleaners, scalers..... | 76 | 122 | 21 | ..... | ..... | 36 | 3 | 20 | 17 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Wire drawers and helpers..... | 70 | 81 | 9 | 22 | ..... | ..... | ..... | ..... | ..... | 26 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Roller levellers, straightener operators..... | 68 | 49 | 3 | 6 | ..... | ..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Boilermakers and helpers and layout..... | 65 | ..... | 11 | 5 | ..... | 5 | 4 | ..... | 51 | ..... | ..... | 4 | ..... | ..... | 3 | ..... | ..... | ..... | ..... |  |
| Crane hookers and operators.... | 61 | 172 | 50 | 31 | ..... | 29 | 7 | 57 | 8 | 27 | 38 | 26 | ..... | 2 | ..... | ..... | ..... | ..... | ..... |  |
| Galvanizers, plating pot operators | 59 | 6 | 33 | 15 | ..... | ..... | ..... | 94 | ..... | 107 | ..... | ..... | ..... | ..... | ..... | 6 | ..... | ..... | ..... |  |
| Motor inspectors and tenders..... | 59 | 12 | 11 | 81 | 29 | ..... | ..... | ..... | 2 | 6 | ..... | 6 | 39 | 9 | 6 | ..... | ..... | ..... | ..... |  |
| Saw men, saw operator, cutter operator..... | 55 | 7 | ..... | ..... | 20 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2 | ..... | ..... | ..... | ..... | ..... |  |
| Picklers and helpers..... | 49 | ..... | 34 | 6 | ..... | ..... | ..... | 48 | ..... | 136 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Hot bed workers and helpers..... | 46 | ..... | ..... | 6 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 6 | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Stockers (open hearth)..... | 44 | 18 | 6 | ..... | ..... | ..... | 12 | ..... | 42 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Warehousemen..... | 40 | ..... | ..... | ..... | ..... | 20 | 20 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Slag men, cinder snappers..... | 39 | 49 | 30 | ..... | ..... | 22 | 27 | 28 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Annealers, deoxidizing gas treaters | 34 | 25 | 31 | ..... | ..... | 16 | 3 | ..... | 9 | 8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Foremen and assistants, supervisors..... | 30 | 10 | 33 | 3 | 5 | 1 | 4 | 2 | 6 | 6 | 8 | 7 | ..... | 5 | 18 | 1 | ..... | ..... | ..... |  |
| Stickers..... | 30 | 30 | ..... | ..... | ..... | ..... | ..... | 11 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Pot runners..... | 29 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Sweepers, janitors..... | 28 | 2 | 5 | 18 | ..... | ..... | ..... | 5 | 23 | 1 | ..... | ..... | ..... | 16 | ..... | ..... | ..... | ..... | ..... |  |
| Scale men, weighers..... | 24 | 9 | ..... | ..... | ..... | ..... | ..... | 11 | 15 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Tool and die makers..... | 22 | ..... | 4 | 3 | 5 | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Samplers, test carriers..... | 18 | 21 | 10 | 15 | ..... | 3 | ..... | ..... | 15 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2 | ..... |  |
| Sand and shot blasters..... | 10 | ..... | ..... | ..... | 3 | ..... | ..... | ..... | ..... | 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Yard men..... | 8 | 97 | 17 | ..... | ..... | 3 | ..... | ..... | ..... | ..... | ..... | 97 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Greasers..... | 8 | 4 | 10 | 103 | ..... | ..... | ..... | 1 | ..... | 1 | ..... | ..... | ..... | 1 | 10 | ..... | ..... | ..... | ..... |  |
| Firemen, coal men (gas producer, boiler, etc.)..... | 3 | 83 | 92 | ..... | ..... | 79 | 56 | 3 | ..... | 15 | 3 | 172 | ..... | ..... | ..... | 45 | ..... | ..... | ..... |  |
| Matchers..... | ..... | 72 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Brick masons, ladle liners, oven patchers..... | ..... | 123 | 83 | ..... | 71 | 12 | 249 | ..... | 53 | 149 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Chemists and metallurgists..... | ..... | ..... | 34 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 127 | ..... | ..... |  |
| Oilers..... | ..... | 1 | ..... | 119 | 14 | ..... | ..... | ..... | ..... | ..... | ..... | 3 | ..... | 4 | 10 | ..... | ..... | ..... | ..... |  |
| Electricians..... | ..... | ..... | 1 | ..... | 183 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 9 | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Carpenters, woodworkers..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 66 | ..... | ..... | ..... | ..... | 4 | ..... |  |
| Miscellaneous..... | 221 | 277 | 80 | 83 | 30 | 57 | 58 | 92 | 47 | 41 | 62 | 22 | 29 | 47 | 9 | 4 | 6 | 12 | 440 | |

¹Occupations given in the table are very general as two large mills were surveyed, each of which employed over 5,000 workers. Many workers were classed under the listed occupations because their operations were similar and yet the name of their occupations are omitted to save space.

²Metals (N. O. S.) includes primarily steel and iron dusts in this industry; for other metals included see material classification in appendix.

³Gases (N. O. S.) includes for the most part carbon dioxide, acetylene and oxides of nitrogen. See appendix.

⁴Next largest material is approximately 0.5% of the total number of exposures.

(N. O. S.) Not otherwise specified.

TABLE 36—IRON FOUNDRY INDUSTRY
MATERIAL EXPOSURE BY OCCUPATION

Survey Data: 86 Plants; 11,691 Employees; 8,268 Employees were given 16,266 Exposures

| OCCUPATION | NUMBER OF WORKERS EXPOSED TO SPECIFIED MATERIALS BY OCCUPATION | | | | | | | | | | | | | | | | | | | |
|---|--|-------------------|-----------------------------|----------------|---------------------|------------------|---------------|---------------------|--------------------|----------------------|-----------------|--------|----------------------|------|------------------|---------------|-----------|-----------------|--------------------------|--|
| | Silica dust | Metals (N. O. S.) | Extreme temperature changes | Silicate dusts | Non-siliceous dusts | Gases (N. O. S.) | Organic dusts | Oil (not petroleum) | Petroleum products | Dermatitis producers | Carbon monoxide | Paints | Bituminous coal dust | Lead | Organic solvents | Mineral acids | Aldehydes | Sulphur dioxide | Miscellaneous materials* | |
| TOTAL NUMBER OF WORKERS EXPOSED.. | 4,808 | 4,580 | 1,202 | 925 | 762 | 725 | 610 | 512 | 489 | 449 | 353 | 168 | 161 | 150 | 52 | 50 | 49 | 44 | 177 | |
| Molders and helpers | 2,110 | 1,227 | 426 | 41 | 264 | 62 | 171 | 21 | 41 | ... | 57 | ... | ... | ... | 19 | ... | 10 | 6 | ... | |
| Core makers (helpers, assemblers, setters) | 751 | 50 | 50 | 5 | ... | 99 | 87 | 428 | 137 | 13 | 11 | ... | 1 | 38 | ... | ... | 23 | 2 | ... | |
| General foundry laborers | 428 | 267 | 30 | 76 | 39 | 12 | 5 | ... | 4 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| Shake-out men | 277 | 14 | ... | 9 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| Tumbler and rattler operators | 200 | 201 | ... | 19 | 4 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| Casting grinders | 181 | 608 | ... | 454 | 141 | ... | 5 | ... | ... | 23 | ... | ... | ... | 3 | ... | ... | ... | ... | ... | |
| Sand mixers, cutters, haulers, driers, etc. | 191 | 7 | ... | 6 | ... | 1 | 12 | 37 | 13 | ... | ... | ... | ... | ... | 1 | ... | ... | ... | ... | |
| Casting cleaners (by hand and air hammer) | 141 | 209 | ... | 12 | 29 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| Sand and shot blasters | 115 | 69 | ... | 28 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| Pourers, ladlers, ladle pushers | 71 | 171 | 125 | ... | ... | 13 | ... | ... | ... | ... | 10 | ... | ... | 1 | ... | ... | ... | ... | ... | |
| Core cleaners | 66 | ... | ... | 52 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| Pattern makers and repairers | 62 | 93 | ... | 10 | 3 | 8 | 159 | 2 | ... | 7 | 8 | ... | ... | 27 | ... | 11 | ... | ... | ... | |
| Cupola charger, tender, tapper, etc. | 39 | 295 | 278 | 56 | 109 | 243 | 3 | ... | ... | 108 | ... | ... | 45 | ... | ... | ... | 4 | ... | ... | |
| Maintenance and repair men | 27 | 46 | ... | 13 | 4 | 6 | ... | 111 | ... | 17 | 11 | 10 | ... | ... | 6 | ... | ... | ... | ... | |
| Welder, torch men, burner | 15 | 103 | ... | 5 | 113 | ... | ... | ... | ... | 52 | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| Annealer and helper | 12 | 41 | 42 | 5 | 12 | 20 | ... | 6 | ... | ... | ... | 4 | ... | ... | 2 | ... | ... | ... | ... | |
| Polisher and buffer | 6 | 33 | ... | 38 | ... | 16 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| Power hammer operator | ... | 38 | 38 | ... | ... | ... | ... | 5 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| Screw machine operator | ... | 35 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| Blacksmith and helper | ... | 22 | 1 | ... | 23 | ... | ... | ... | ... | ... | 5 | ... | 2 | ... | ... | ... | ... | ... | ... | |
| Scraper, rust cleaner | ... | 65 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| Tool and die maker, tool sharpener | ... | 51 | ... | 29 | 3 | 3 | ... | ... | 1 | 12 | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| Machinists (N. O. S.) | ... | 182 | ... | 32 | 18 | ... | ... | 14 | 39 | 123 | ... | ... | ... | 6 | ... | ... | ... | ... | ... | |
| Lathe and turret lathe operators | ... | 215 | ... | ... | ... | ... | ... | ... | ... | 72 | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| Miscellaneous machine operators (N. O. S.) | ... | 217 | ... | 8 | 7 | 2 | ... | ... | 16 | 90 | ... | ... | ... | 2 | ... | 2 | ... | ... | ... | |
| Drilling and boring machine operator | ... | 131 | ... | 11 | ... | 5 | ... | ... | 64 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| Heat treater, quencher | ... | 18 | 76 | ... | ... | 19 | ... | ... | 29 | ... | 9 | ... | ... | ... | ... | ... | ... | ... | ... | |
| Pig iron and casting hauler | ... | ... | 33 | 9 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| Ladle and cupola maker, repair, reliner | ... | ... | 23 | ... | 3 | 6 | ... | ... | ... | ... | 4 | ... | ... | ... | ... | ... | ... | ... | ... | |
| Boiler fireman | ... | ... | 16 | 59 | ... | 14 | 2 | ... | 3 | ... | 48 | ... | 63 | ... | ... | ... | ... | 32 | ... | |
| Babbitt workers | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 7 | ... | ... | ... | ... | ... | |
| Coal pulverizers, chargers | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 16 | ... | ... | ... | ... | ... | ... | |
| Coal unloaders, wheelers | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 19 | ... | ... | ... | ... | ... | ... | |
| Layout man, steel worker | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 25 | ... | 39 | ... | 20 | ... | ... | ... | |
| Hand, spray and dip painter | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 131 | ... | 6 | 19 | ... | ... | ... | ... | |
| Electrician | ... | ... | ... | ... | ... | ... | ... | ... | ... | 17 | ... | ... | ... | 2 | 2 | 1 | ... | ... | ... | |
| Oil furnace and diesel engine tenders | ... | ... | ... | ... | ... | ... | ... | ... | 27 | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| Stationery engineer and helper | ... | ... | ... | ... | ... | ... | ... | ... | 29 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| Carpenter, woodworker | ... | ... | ... | ... | ... | ... | 115 | ... | 3 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| Oven tender, core baker, oven man | ... | ... | ... | ... | 23 | ... | ... | ... | 2 | ... | 8 | ... | 7 | ... | ... | ... | 16 | ... | ... | |
| Miscellaneous | 116 | 172 | 64 | 49 | 25 | 58 | 30 | 10 | 23 | 10 | 22 | 2 | 4 | 19 | 3 | 16 | ... | ... | 177 | |

*Percent is less than 0.2% of the total number of exposures.
(N. O. S.) Not otherwise specified.

•
NONFERROUS
INDUSTRIES
•

Metal Industries Except Iron and Steel

The sub-groups listed in this industry, as well as material exposures tabulated for these sub-groups, are presented in Table 37.

Exposures: Metals (N. O. S.), lead, non-siliceous, silica and organic dusts seem to be the major exposures. Since quite a sizable number of lead and zinc plants were studied, one would anticipate lead to be a problem for this industry.

Controls: Types of control measures used for the specific exposure groups are indicated in Table 38. Of the 840 workers potentially shown as exposed to lead 47.7% were provided with one or more controls. These controls were chiefly local exhausts and respirators. Again, 4% of the exposed workers were provided with respirators which were not approved for lead fumes or dust.

Musical Instrument Industry; Occupational Analysis: It may be seen from Table 39 that for this industry metallic, non-siliceous, silica, organic and silicate dusts seem to be the major exposures. Further it is evident that all these exposures are practically concentrated in one operation; that of polisher, burnisher and buffer. These are usually some type of grinding operations and by local exhaust methods, these exposures would be minimized. This table illustrates beautifully the value of occupational analysis of exposures for future control programs.

TABLE 37—METAL INDUSTRIES EXCEPT IRON AND STEEL

| MATERIAL | NUMBER AND PERCENT OF WORKERS IN EACH SUB GROUP EXPOSED TO SPECIFIED MATERIALS | | | | | | | | | | | | | | | | | | | | |
|----------------------------------|--|-------|-------------------------------------|-------|--------|-------|---------|-------|---------------|-------|------------------------|-------|----------|-------|------------------------------|-------|-----------------------------|-------|----------------|-------|------|
| | Total | | Brass mills and musical instruments | | Copper | | Jewelry | | Lead and zinc | | Tinware and enamelware | | Aluminum | | Metal specialties, novelties | | (N. O. S.) Metal industries | | Electroplating | | |
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | |
| TOTAL NUMBER ALL WORKERS..... | 9,474 | ..... | 2,161 | 22.8 | 1,799 | 19.0 | 369 | 3.9 | 757 | 8.0 | 2,276 | 24.0 | 336 | 3.6 | 239 | 2.5 | 1,157 | 12.2 | 380 | 4.0 | |
| Metals (N. O. S.)..... | 2,959 | 31.2 | 851 | 39.4 | 181 | 10.1 | 214 | 58.0 | 172 | 22.7 | 521 | 22.9 | 153 | 45.5 | 35 | 14.6 | 589 | 50.9 | 243 | 63.9 | |
| Lead..... | 940 | 9.9 | 188 | 4.1 | 134 | 7.4 | 12 | 3.3 | 269 | 35.5 | 177 | 7.8 | 12 | 3.6 | 1 | 0.4 | 76 | 6.6 | 51 | 12.3 | |
| Non-siliceous dusts..... | 716 | 7.6 | 189 | 6.0 | 225 | 12.5 | 38 | 10.3 | 38 | 5.0 | 113 | 5.0 | 14 | 4.2 | 8 | 3.7 | 76 | 6.6 | 55 | 14.3 | |
| Gases (N. O. S.)..... | 547 | 5.8 | 138 | 6.3 | 150 | 7.2 | 24 | 6.5 | 9 | 12.7 | 45 | 2.1 | 20 | 6.0 | 4 | 1.7 | 128 | 2.4 | 39 | 10.3 | |
| Silica dust..... | 486 | 4.8 | 294 | 13.6 | 7 | 0.3 | 2 | 0.5 | 5 | 1.6 | 48 | 2.1 | 20 | 6.0 | 6 | 2.5 | 113 | 9.8 | 39 | 10.3 | |
| Organic dusts..... | 454 | 4.8 | 123 | 5.6 | 7 | 0.3 | 16 | 4.3 | 14 | 1.8 | 163 | 7.2 | 22 | 6.5 | 44 | 18.4 | 67 | 5.8 | 70 | 18.4 | |
| Petroleum products..... | 433 | 4.6 | 48 | 2.2 | 52 | 2.9 | 3 | 0.8 | 14 | 1.8 | 103 | 4.4 | 35 | 10.4 | 3 | 1.3 | 41 | 3.5 | 14 | 3.7 | |
| Silicate dusts..... | 413 | 4.3 | 112 | 5.2 | 41 | 2.3 | 5 | 1.4 | 18 | 2.4 | 101 | 4.4 | 35 | 10.4 | 3 | 1.3 | 41 | 3.5 | 14 | 3.7 | |
| Paints..... | 412 | 4.3 | 8 | 0.2 | 38 | 2.2 | ..... | ..... | 146 | 19.3 | 203 | 9.0 | 33 | 9.8 | 1 | 0.4 | 77 | 6.7 | 3 | 0.8 | |
| Extreme temperature changes..... | 381 | 4.0 | 40 | 1.9 | 36 | 2.0 | 6 | 1.6 | 12 | 1.6 | 146 | 6.4 | 17 | 5.1 | 23 | 9.6 | 47 | 4.1 | ..... | ..... |  |
| Dermatitis producers..... | 366 | 3.9 | 78 | 3.6 | 43 | 2.4 | 25 | 6.8 | 13 | 1.7 | 68 | 3.0 | 3 | 0.7 | 3 | 1.3 | 38 | 3.3 | 104 | 27.4 | |
| Mineral acids..... | 325 | 3.4 | 29 | 1.3 | 40 | 2.2 | 25 | 6.8 | 24 | 3.2 | 91 | 4.0 | 3 | 0.7 | 3 | 1.3 | 25 | 2.2 | 1 | 1.1 | |
| Carbon monoxide..... | 315 | 3.4 | 18 | 0.8 | 16 | 0.9 | 49 | 13.3 | 24 | 3.2 | 98 | 3.0 | 7 | 2.1 | 4 | 1.7 | 3 | 0.3 | 12 | 3.2 | |
| Organic solvents..... | 206 | 2.2 | 20 | 0.9 | 95 | 5.3 | 2 | 0.5 | 11 | 1.5 | 68 | 3.0 | 1 | 0.3 | 1 | 0.4 | 38 | 3.3 | 52 | 13.7 | |
| Alkalis..... | 146 | 1.5 | 29 | 1.3 | 42 | 2.3 | 4 | 1.1 | 10 | 1.3 | 24 | 1.1 | 4 | 1.2 | 5 | 2.1 | 31 | 2.7 | 32 | 8.4 | |
| Oil (not petroleum)..... | 139 | 1.5 | 56 | 2.6 | 8 | 0.4 | 22 | 6.0 | 9 | 1.2 | 14 | 0.6 | ..... | ..... | ..... | ..... | 7 | 0.6 | 63 | 16.6 | |
| Lacquers..... | 139 | 1.5 | 11 | 0.5 | 79 | 4.4 | 22 | 6.0 | 1 | 0.1 | 14 | 0.6 | ..... | ..... | ..... | ..... | 1 | 0.4 | 18 | 4.6 | |
| Cyanides..... | 132 | 1.4 | 31 | 1.4 | | 8 | 2.2 | | | 11 | 0.5 | | | | | 1 | 0.4 | 3 | 0.3 | 15 | 3.9 |
| Alcohols, esters and ethers..... | 100 | 1.1 | 12 | 0.6 | | 12 | 3.3 | | | 3 | 0.4 | 20 | 0.9 | 1 | 0.3 | 1 | 0.4 | 9 | 0.8 | 66 | 17.4 |
| High humidity..... | 94 | 1.0 | 3 | 0.1 | 42 | 2.3 | ..... | ..... | 3 | 0.4 | 20 | 0.9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Chromium..... | 93 | 1.0 | 25 | 1.2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Coal tar products..... | 84 | 0.9 | ..... | ..... | 81 | 4.5 | ..... | ..... | 3 | 0.4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Bituminous coal dust..... | 82 | 0.9 | 9 | 0.4 | 11 | 0.6 | 4 | 1.1 | 21 | 2.8 | 21 | 0.9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Sulphur and compounds..... | 70 | 0.7 | 11 | 0.5 | 20 | 1.1 | 3 | 0.8 | 17 | 2.2 | 9 | 0.4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Antimony..... | 64 | 0.7 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Benzene..... | 62 | 0.7 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Chemicals (N. O. S.)..... | 57 | 0.6 | 2 | ..... | 11 | 0.6 | 4 | 1.1 | 22 | 2.9 | 9 | 0.4 | 2 | 0.6 | ..... | ..... | 7 | 0.6 | 2 | 0.5 | |
| Sulphur dioxide..... | 49 | 0.5 | 7 | 0.3 | 11 | 0.6 | ..... | ..... | 7 | 0.9 | 18 | 0.8 | ..... | ..... | ..... | ..... | 4 | 0.3 | 2 | 0.5 | |
| Fluorides..... | 47 | 0.5 | ..... | ..... | 3 | 0.2 | ..... | ..... | 30 | 4.0 | 12 | 0.5 | ..... | ..... | ..... | ..... | ..... | ..... | 25 | 6.6 | |
| Cadmium..... | 39 | 0.4 | 14 | 0.6 | ..... | ..... | ..... | ..... | ..... | ..... | 6 | 0.3 | ..... | ..... | 1 | 0.4 | 3 | 0.3 | 14 | 3.7 | |
| Halogenated hydrocarbons..... | 28 | 0.3 | 4 | 0.2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Accelerators..... | 20 | 0.2 | ..... | ..... | 20 | 1.1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Aldehydes..... | 12 | 0.1 | 9 | 0.4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Inks..... | 11 | 0.1 | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Asbestos dust..... | 10 | 0.1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Arsenic..... | 7 | ..... | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Medicinals..... | 6 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Organic acids..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Salts (N. O. S.)..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Infections..... | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Manganese..... | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| Mercury..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |

*Less than 0.1%
(N. O. S.) Not otherwise specified.

TABLE 33—METAL INDUSTRY OTHER THAN IRON AND STEEL—CONTROLS

| MATERIAL | Number of workers exposed | PERCENT OF EXPOSED WORKERS HAVING INDICATED TYPE OF CONTROL | | | | | | | | | | Percent of exposed workers having one or more controls | |
|----------------------------------|---------------------------|---|----------|---------------|------------------|------------|----------|---------------|--------------|---------------------|---------------------|--|-------|
| | | General ventilation | | Local exhaust | Enclosed process | Wet method | Gas mask | Respirator | | Air line respirator | Protective clothing | | Other |
| | | Positive | Negative | | | | | Approved type | Not approved | | | | |
| Metals (N. O. S.)..... | 2,959 | 0.7 | 10.0 | 25.3 | 1.6 | 6.1 | ..... | 2.6 | 4.5 | 0.4 | 0.3 | ..... | 41.1 |
| Lead..... | 840 | ..... | 12.9 | 25.7 | 2.9 | 1.2 | ..... | 13.0 | 4.0 | ..... | ..... | ..... | 47.7 |
| Non-siliceous dusts..... | 716 | ..... | 5.4 | 30.9 | 7.8 | 6.3 | ..... | 0.7 | 0.1 | ..... | ..... | ..... | 46.8 |
| Gases (N. O. S.)..... | 547 | 4.4 | 5.3 | 18.1 | ..... | ..... | ..... | ..... | 0.5 | ..... | ..... | 0.2 | 26.1 |
| Silica dust..... | 458 | 3.5 | 15.3 | 43.7 | 10.5 | 2.8 | ..... | 11.6 | 6.3 | 2.8 | 0.4 | ..... | 62.9 |
| Organic dusts..... | 454 | 0.4 | 8.8 | 55.9 | 0.4 | ..... | ..... | 2.6 | 7.5 | ..... | ..... | ..... | 60.1 |
| Petroleum products..... | 433 | ..... | 1.4 | 5.8 | ..... | 0.5 | ..... | ..... | ..... | ..... | ..... | ..... | 7.6 |
| Silicate dusts..... | 413 | ..... | 8.5 | 27.1 | 0.2 | 1.5 | ..... | 1.0 | 4.4 | ..... | ..... | ..... | 36.8 |
| Paints..... | 412 | 17.2 | 2.9 | 56.6 | 1.7 | ..... | ..... | 4.6 | 5.1 | 0.7 | ..... | ..... | 65.5 |
| Extreme temperature changes..... | 381 | 0.3 | 5.5 | 13.4 | 0.3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 19.4 |
| Dermatitis producers..... | 365 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 0.8 | ..... | 5.2 |
| Mineral acids..... | 325 | 1.5 | 33.5 | 30.8 | 7.4 | ..... | ..... | ..... | ..... | ..... | 19.1 | 1.2 | 65.8 |
| Carbon monoxide..... | 233 | 1.3 | 2.6 | 5.6 | ..... | ..... | ..... | ..... | 0.9 | ..... | ..... | ..... | 9.4 |
| Organic solvents..... | 215 | 8.8 | 7.4 | 10.7 | 33.5 | ..... | ..... | 4.2 | 0.9 | ..... | 2.3 | ..... | 60.0 |
| Alkalis..... | 206 | 4.4 | 22.3 | 40.8 | 12.1 | ..... | ..... | 1.5 | ..... | ..... | 20.4 | ..... | 66.5 |
| Oils (not petroleum)..... | 146 | 6.2 | 17.3 | 4.1 | ..... | ..... | ..... | ..... | ..... | ..... | 2.7 | ..... | 24.7 |
| Lacquers..... | 139 | ..... | 7.9 | 36.0 | 54.7 | ..... | ..... | 4.3 | 4.3 | ..... | 6.8 | 2.2 | 89.2 |
| Cyanides..... | 132 | ..... | 40.9 | 62.1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 64.4 |
| Alcohols, esters and ethers..... | 100 | ..... | 65.0 | 7.0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 72.0 |
| High humidity..... | 94 | 3.2 | 18.1 | 9.6 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 4.0 | 26.6 |
| Chromium..... | 93 | ..... | 33.3 | 95.7 | ..... | ..... | ..... | ..... | ..... | ..... | 1.1 | ..... | 97.8 |
| Coal tar products..... | 84 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Bituminous coal dust..... | 82 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Sulphur..... | 70 | ..... | 28.6 | 64.3 | ..... | ..... | ..... | 30.0 | 28.6 | ..... | ..... | ..... | 64.3 |
| Antimony..... | 64 | 14.1 | 15.6 | 21.9 | ..... | ..... | ..... | ..... | 14.1 | ..... | ..... | ..... | 46.9 |
| Benzene..... | 62 | ..... | 93.5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 93.5 |
| Chemicals (N. O. S.)..... | 57 | 1.8 | 5.3 | 8.8 | ..... | ..... | ..... | ..... | ..... | ..... | 1.8 | ..... | 15.8 |
| Sulphur dioxide..... | 49 | ..... | 8.2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 8.2 |
| Fluorides..... | 47 | 14.9 | 14.9 | 25.5 | ..... | ..... | ..... | ..... | 14.9 | ..... | 57.4 | ..... | 72.3 |
| Cadmium..... | 39 | ..... | 43.6 | 66.7 | ..... | ..... | ..... | ..... | ..... | ..... | 5.1 | ..... | 74.4 |
| Halogenated hydrocarbons..... | 28 | ..... | 53.6 | 3.6 | ..... | ..... | ..... | ..... | ..... | ..... | 7.1 | ..... | 71.4 |
| Accelerators..... | 20 | ..... | 100.0 | 100.0 | 25.0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 100.0 |
| Aldehydes..... | 12 | ..... | 75.0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 75.0 |
| Inks..... | 11 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Asbestos dust..... | 11 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Arsenic..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10.0 | ..... | ..... | ..... | 10.0 |
| Medicinals..... | 7 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Organic acids..... | 6 | ..... | 33.3 | ..... | 50.0 | ..... | ..... | ..... | ..... | ..... | 33.3 | ..... | 83.3 |
| Infections..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 50.0 | ..... | 50.0 |
| Salts (N. O. S.)..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Manganese..... | 3 | ..... | 33.3 | 33.3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 33.3 |
| Mercury..... | 1 | ..... | 100.0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 100.0 |

(N. O. S.) Not otherwise specified.

TABLE 39—MUSICAL INSTRUMENT INDUSTRY:
MATERIAL EXPOSURE BY OCCUPATION
Survey Data: 10 Plants; 1,420 Employees; 504 Employees were given 1,010 Exposures

| OCCUPATION | NUMBER OF WORKERS EXPOSED TO SPECIFIED MATERIALS BY OCCUPATION | | | | | | | | | | | | |
|--|---|---------------------|-------------|---------------|----------------|------|-------------------------|----------|---------------|---------|---------|----------|---|
| | Metals (N. O. S.): ¹ | Non-siliceous dusts | Silica dust | Organic dusts | Silicate dusts | Lead | Dermatitis producers | Cyanides | Mineral acids | Alkalis | Cadmium | Chromium | Petroleum products Miscellaneous ² materials |
| TOTAL NUMBER OF WORKERS EXPOSED..... | 425 | 85 | 84 | 74 | 72 | 51 | 40 | 27 | 23 | 21 | 14 | 14 | 11 69 |
| Polishers, burnishers, buffers..... | 145 | 60 | 69 | 46 | 28 | | 34 | | | | | | |
| Screw machine operators..... | 41 | | | | | | | 27 | 23 | 21 | 14 | 14 | |
| Cleaners and platers..... | 32 | | | | | | | | | | | | |
| Tool makers..... | 32 | | | | | | | | | | | | |
| Semi-finish assemblers..... | 23 | 23 | | | | 23 | | | | | | | |
| Valve makers..... | 23 | | | | 23 | | | | | | | | |
| Solderers and brazers..... | 21 | | | | | 12 | | | | | | | |
| Padders and assemblers, pad makers..... | 19 | | | 2 | | | | | | | | | |
| Bell makers..... | 14 | | | | | | | | | | | | |
| Scrapers and raggers..... | 14 | | | 7 | 7 | 7 | | | | | | | |
| Engravers..... | 10 | | | | | | | | | | | | |
| Wire and abrasive wheel operators, grinders..... | 9 | 2 | 1 | 3 | 1 | | | | | | | | |
| Maintenance men, machine operators (N. O. S.)..... | 8 | | 1 | | | | | | | | | | 10 |
| Milling machine operators..... | 6 | | | | | | | | | | | | |
| Lathe operators..... | 5 | | | 2 | | | | | | | | | |
| Sand and shot blasters..... | 4 | | 4 | | | | | | | | | | |
| Flute makers..... | 3 | | | | | 3 | | | | | | | |
| Musical instrument part makers (N. O. S.)..... | 3 | | | | 3 | | | | | | | | |
| Furnace tenders, boiler firemen..... | 2 | | | | 8 | 1 | | | | | | | |
| Molders..... | 2 | | 6 | | | | | | | | | | |
| Drum makers (wood and leather workers)..... | | | | 10 | | 4 | | | | | | | |
| Miscellaneous..... | 9 | | 3 | 4 | 2 | 1 | 6 | | | | | | 1 69 |

¹The Musical Instrument Industry is classified in the Brass Mills and Musical Instrument group. This table presents only musical instrument plants. It is primarily band instruments and does not include pianos.

²The classification, Metals (N. O. S.) in this case is primarily for brass with some steel, gold and silver.

³The next largest material is less than 1.0% of the total number of exposures.

(N. O. S.) Not otherwise specified.

•
LEATHER
INDUSTRY
•

Leather Industry

Exposures: This is a minor industry for Indiana. Dermatitis producers and organic dusts seem to be the chief tabulated exposures as recorded on Table 40. The dermatitis occurs chiefly in the preparation of the leather and in using various dyes and stains.

Controls: Roughly 16.6% of the 338 workers exposed to dermatitis producing substances had some type of control, and 40.5% of the 215 workers exposed to organic dusts had some type of control. (See Table 41 for detailed analysis.)

TABLE 40—LEATHER

| MATERIAL | NUMBER AND PERCENT OF WORKERS IN EACH SUB GROUP EXPOSED TO SPECIFIED MATERIAL | | | | | | | | | |
|------------------------------------|---|-------|-------|-------|----------|-------|-------------------------|-------|--------------------------|-------|
| | Total | | Shoes | | Tannerie | | Trunk, Suitcase and bag | | Other Leather industries | |
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| TOTAL NUMBER WORKERS EMPLOYED..... | 2,056 | ..... | 1,616 | 78.6 | 296 | 14.4 | 59 | 2.9 | 85 | 4.1 |
| Dermatitis producers..... | 338 | 16.4 | 219 | 13.6 | 92 | 31.1 | 10 | 16.9 | 17 | 20.0 |
| Organic dusts..... | 215 | 10.5 | 150 | 9.3 | 17 | 5.7 | 22 | 37.3 | 26 | 30.6 |
| High humidity..... | 127 | 6.2 | 37 | 2.3 | 85 | 28.7 | ..... | ..... | 5 | 5.9 |
| Dyes..... | 90 | 4.4 | 55 | 3.4 | 28 | 9.5 | 7 | 11.9 | ..... | ..... |
| Oil (not petroleum)..... | 50 | 2.4 | 5 | 0.3 | 44 | 14.9 | ..... | ..... | 1 | 1.8 |
| Mercury..... | 40 | 1.9 | 40 | 2.5 | ..... | ..... | ..... | ..... | ..... | ..... |
| Gases (N. O. S.)..... | 39 | 1.9 | 39 | 2.4 | ..... | ..... | ..... | ..... | ..... | ..... |
| Ink..... | 37 | 1.8 | 34 | 2.1 | ..... | ..... | 3 | 5.1 | ..... | ..... |
| Non-siliceous dusts..... | 36 | 1.8 | 26 | 1.6 | 7 | 2.4 | 3 | 5.1 | ..... | ..... |
| Infections..... | 30 | 1.5 | ..... | ..... | 25 | 8.4 | ..... | ..... | 5 | 5.9 |
| Aniline..... | 27 | 1.3 | 11 | 0.7 | 16 | 5.4 | ..... | ..... | ..... | ..... |
| Organic solvents..... | 26 | 1.3 | 22 | 1.4 | ..... | ..... | ..... | ..... | 4 | 4.7 |
| Petroleum products..... | 23 | 1.1 | 12 | 0.7 | 11 | 3.7 | ..... | ..... | ..... | ..... |
| Silica dust..... | 20 | 1.0 | 20 | 1.2 | ..... | ..... | ..... | ..... | ..... | ..... |
| Silicate dusts..... | 20 | 1.0 | 10 | 0.6 | 9 | 3.0 | ..... | ..... | 1 | 1.8 |
| Alkalis..... | 19 | 0.9 | 19 | 1.2 | ..... | ..... | ..... | ..... | ..... | ..... |
| Carbon monoxide..... | 17 | 0.8 | 8 | 0.5 | 8 | 2.7 | ..... | ..... | 1 | 1.8 |
| Bituminous coal dust..... | 15 | 0.7 | 7 | 0.4 | 8 | 2.7 | ..... | ..... | ..... | ..... |
| Sulphur dioxide..... | 15 | 0.7 | 7 | 0.4 | 8 | 2.7 | ..... | ..... | ..... | ..... |
| Organic acids..... | 14 | 0.7 | ..... | ..... | 14 | 4.7 | ..... | ..... | ..... | ..... |
| Salts (N. O. S.)..... | 12 | 0.6 | ..... | ..... | 12 | 4.1 | ..... | ..... | ..... | ..... |
| Extreme temperature changes..... | 8 | 0.4 | 6 | 0.4 | 2 | 0.7 | ..... | ..... | ..... | ..... |
| Lead..... | 8 | 0.4 | 8 | 0.5 | ..... | ..... | ..... | ..... | ..... | ..... |
| Metals (N. O. S.)..... | 7 | 0.3 | 4 | 0.2 | ..... | ..... | ..... | ..... | 3 | 3.5 |
| Chemicals (N. O. S.)..... | 7 | 0.3 | 4 | 0.2 | 3 | 1.0 | ..... | ..... | ..... | ..... |
| Mineral acids..... | 5 | 0.2 | ..... | ..... | 5 | 1.7 | ..... | ..... | ..... | ..... |
| Paints..... | 2 | * | 1 | * | ..... | ..... | 1 | 1.7 | ..... | ..... |
| Chromium..... | 2 | * | ..... | ..... | 2 | 0.7 | ..... | ..... | ..... | ..... |
| Lacquers..... | 1 | * | 1 | * | ..... | ..... | ..... | ..... | ..... | ..... |
| Coal tar products..... | 1 | * | 1 | * | ..... | ..... | ..... | ..... | ..... | ..... |
| Medicinals..... | 1 | * | 1 | * | ..... | ..... | ..... | ..... | ..... | ..... |

*Less than 0.1%

(N. O. S.) Not otherwise specified.

TABLE 41—LEATHER—CONTROLS
21 Plants—2,056 Employees

| MATERIAL | Number of workers exposed | PERCENT OF EXPOSED WORKERS HAVING INDICATED TYPE OF CONTROLS | | | | | | | | | | Percent of exposed workers having one or more controls | |
|----------------------------------|---------------------------|--|----------|---------------|------------------|------------|----------|---------------|--------------|---------------------|---------------------|--|-------|
| | | General ventilation | | Local exhaust | Enclosed process | Wet method | Gas mask | Respirator | | Air line respirator | Protective clothing | | Other |
| | | Positive | Negative | | | | | Approved type | Not approved | | | | |
| Dermatitis producers..... | 338 | | | | | | | | | | | | 16.6 |
| Organic dusts..... | 215 | | | 38.1 | | 2.3 | | | 2.8 | | | | 40.5 |
| High humidity..... | 127 | | | 3.1 | | | | | | | | | 10.2 |
| Dyes..... | 90 | 7.1 | | 17.8 | | | | | 4.4 | | | | 17.8 |
| Oil (not petroleum)..... | 50 | | | | | | | | | | 4.0 | | 4.0 |
| Mercury..... | 40 | | | | | | | | | | | | |
| Gases (N. O. S.)..... | 39 | | | | | | | | | | | | |
| Inks..... | 37 | | | 15.4 | | | 2.6 | | | | | | 17.9 |
| Non-siliceous dusts..... | 36 | | | 58.3 | | | | | 2.8 | | | | 58.3 |
| Infections..... | 30 | | | | | | | | | | | | |
| Aniline..... | 27 | | | 22.2 | | | | | 14.8 | | 46.7 | | 46.7 |
| Organic solvents..... | 26 | | | 69.2 | | | | | | | | | 22.2 |
| Petroleum products..... | 23 | | | 13.0 | 13.0 | | | | | | | | 69.2 |
| Silica dust..... | 20 | | | 100.0 | | | | | | | | | 13.0 |
| Silicate dusts..... | 20 | | | 10.0 | | | | | 30.0 | | | | 100.0 |
| Alkalis..... | 20 | | | 10.0 | | | | | | | | | 10.0 |
| Carbon monoxide..... | 19 | | | 10.5 | | | | | | | | | 10.5 |
| Bituminous coal dust..... | 17 | | | | | | | | | | | | |
| Sulphur dioxide..... | 15 | | | | | | | | | | | | |
| Organic acids..... | 15 | | | | | | | | | | | | |
| Salts (N. O. S.)..... | 14 | | | | | | | | | | | | |
| Extreme temperature changes..... | 12 | | | | | | | | | | | | |
| Lead..... | 8 | | | 25.0 | | | | | | | | | 25.0 |
| Metals (N. O. S.)..... | 7 | | | | | | | | | | | | |
| Chemicals (N. O. S.)..... | 7 | | | | | | | | | | | | |
| Mineral acids..... | 5 | | | | | | | | | | | 60.0 | 60.0 |
| Paints..... | 5 | | | 100.0 | | | | | | | | | 100.0 |
| Chromium..... | 2 | | | | | | | | | | | | |
| Lacquers..... | 2 | | | | | | | | | | | | |
| Coal tar products..... | 1 | | | | | | | | | | | | |
| Medicinals..... | 1 | | | | | | | | | 100.0 | | | 100.0 |

(N. O. S.) Not otherwise specified.

•
LUMBER AND
FURNITURE
INDUSTRY
•

Lumber and Furniture Industry

The lumber and furniture industry is a rather large industry in Indiana, consequently 18,757 workers were surveyed in this group.

Exposures: Table 42 indicates that exposures to organic dusts, silica dusts and dermatitis producers are the numerically significant exposures. The relatively high number of silica exposures may be explained by the rather frequent use of sandstone grinding wheels in the industry. Dermatitis producers were high in number due to the handling of various tars, waxes, and wet woods as well as trade callosities developed in the various rubbing operations.

Controls: 61.9% of the 6,448 workers having exposures to organic (wood) dusts had some type of controls installed. The control method was chiefly local exhaust. Practically 52% of the workers working in a silica dust environment had some type of control for that exposure. This, too, was usually a local exhaust method. (See Table 43.)

TABLE 42—LUMBER AND FURNITURE

| MATERIAL | NUMBER AND PERCENT OF WORKERS IN EACH SUB GROUP EXPOSED TO SPECIFIED MATERIAL | | | | | | | | | | | |
|----------------------------------|---|-------|-----------|-------|---------|-------|-------------------|-------|-----------------------|-------|--------------------|-------|
| | Total | | Furniture | | Caskets | | Pianos and organs | | Saw and planing mills | | Other wood-working | |
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| TOTAL NUMBER WORKERS EMPLOYED | 18,757 | ..... | 12,953 | 69.1 | 802 | 4.3 | 341 | 1.8 | 1,021 | 5.4 | 3,640 | 19.4 |
| Organic dusts..... | 6,448 | 34.4 | 4,551 | 35.1 | 284 | 35.4 | 77 | 22.6 | 332 | 32.5 | 1,204 | 33.1 |
| Silica dusts..... | 1,534 | 8.2 | 1,303 | 10.1 | 62 | 7.7 | 24 | 7.0 | 18 | 1.8 | 127 | 3.5 |
| Dermatitis producers..... | 1,468 | 7.8 | 1,013 | 7.8 | 126 | 15.7 | 32 | 9.4 | 15 | 1.5 | 282 | 7.7 |
| Lacquers..... | 689 | 3.7 | 577 | 4.5 | 32 | 4.0 | 19 | 5.6 | 1 | 0.1 | 60 | 1.6 |
| Organic solvents..... | 558 | 2.9 | 458 | 3.5 | 28 | 3.5 | 10 | 2.9 | ..... | ..... | 42 | 1.2 |
| Silicate dusts..... | 513 | 2.7 | 348 | 2.7 | 45 | 5.6 | 23 | 6.7 | 32 | 3.1 | 65 | 1.8 |
| Metals (N. O. S.)..... | 372 | 2.0 | 161 | 1.2 | 98 | 12.2 | 23 | 6.7 | 15 | 1.5 | 75 | 2.1 |
| Dyes..... | 352 | 1.9 | 330 | 2.5 | 11 | 1.4 | 6 | 1.8 | ..... | ..... | 5 | 0.1 |
| Paints..... | 337 | 1.8 | 284 | 2.2 | 8 | 1.0 | 6 | 1.8 | 2 | 0.2 | 37 | 1.0 |
| Non-siliceous dusts..... | 310 | 1.7 | 251 | 1.9 | 16 | 2.0 | 3 | 0.9 | 13 | 1.3 | 27 | 0.7 |
| Petroleum products..... | 281 | 1.5 | 193 | 1.5 | 9 | 1.1 | 18 | 5.3 | 6 | 0.6 | 55 | 1.5 |
| Bituminous coal dust..... | 266 | 1.4 | 186 | 1.4 | 7 | 0.9 | 7 | 2.1 | 20 | 2.0 | 46 | 1.3 |
| Carbon monoxide..... | 255 | 1.4 | 170 | 1.3 | 12 | 1.5 | 4 | 1.2 | 15 | 1.5 | 54 | 1.5 |
| High humidity..... | 206 | 1.1 | 67 | 0.5 | 6 | 0.7 | ..... | ..... | 12 | 1.2 | 121 | 3.3 |
| Sulphur dioxide..... | 203 | 1.1 | 145 | 1.1 | 5 | 0.6 | 4 | 1.2 | 11 | 1.1 | 38 | 1.0 |
| Gases (N. O. S.)..... | 159 | 0.8 | 63 | 0.5 | 42 | 5.2 | ..... | ..... | 7 | 0.7 | 47 | 1.3 |
| Lead..... | 158 | 0.8 | 79 | 0.6 | 59 | 7.4 | ..... | ..... | 1 | 0.1 | 19 | 0.5 |
| Oil (not petroleum)..... | 144 | 0.8 | 137 | 1.1 | 4 | 0.5 | ..... | ..... | 2 | 0.2 | 1 | ..... |
| Alcohols, esters and ethers..... | 57 | 0.3 | 50 | 0.4 | ..... | ..... | ..... | ..... | ..... | ..... | 7 | 0.2 |
| Extreme temperature changes..... | 53 | 0.3 | 20 | 0.2 | 2 | 0.2 | 3 | 0.9 | 6 | 0.6 | 22 | 0.6 |
| Mineral acids..... | 46 | 0.2 | 14 | 0.1 | 27 | 3.4 | 4 | 1.2 | ..... | ..... | 1 | ..... |
| Inks..... | 37 | 0.2 | 29 | 0.2 | 2 | 0.2 | ..... | ..... | ..... | ..... | 6 | 0.2 |
| Alkalis..... | 28 | 0.1 | 11 | ..... | 17 | 2.1 | ..... | ..... | ..... | ..... | ..... | ..... |
| Benzene..... | 23 | 0.1 | 19 | 0.1 | ..... | ..... | ..... | ..... | 4 | 0.4 | ..... | ..... |
| Antimony..... | 19 | 0.1 | 2 | ..... | 17 | 2.1 | 1 | 0.3 | ..... | ..... | ..... | ..... |
| Cyanides..... | 19 | 0.1 | 1 | ..... | 17 | 2.1 | 1 | 0.3 | ..... | ..... | ..... | ..... |
| Chromium..... | 12 | ..... | 4 | ..... | 5 | 0.6 | 3 | 0.9 | ..... | ..... | ..... | ..... |
| Coal tar products..... | 7 | ..... | ..... | ..... | ..... | ..... | 3 | 0.9 | ..... | ..... | 4 | 0.1 |
| Salts..... | 5 | ..... | 2 | ..... | 3 | 0.4 | ..... | ..... | ..... | ..... | ..... | ..... |
| Aldehydes..... | 5 | ..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 | ..... |
| Cadmium..... | 5 | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 4 | 0.1 |
| Aniline..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 4 | 0.1 |
| Hydrogen sulphide..... | 4 | ..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Chemicals (N. O. S.)..... | 3 | ..... | 1 | ..... | 2 | 0.2 | ..... | ..... | ..... | ..... | ..... | ..... |
| Medicinals..... | 3 | ..... | 2 | ..... | 1 | 0.1 | ..... | ..... | ..... | ..... | ..... | ..... |
| Infections..... | 2 | ..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Sulphur..... | 2 | ..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Accelerators..... | 2 | ..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Anthracite coal dust..... | 2 | ..... | ..... | ..... | 2 | 0.2 | ..... | ..... | ..... | ..... | ..... | ..... |
| Chlorine..... | 1 | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

*Less than 0.1%
(N. O. S.) Not otherwise specified.

TABLE 43—LUMBER AND FURNITURE—CONTROLS
287 Plants—18,757 Employees

| MATERIAL | Number of workers exposed | PERCENT OF EXPOSED WORKERS HAVING INDICATED TYPE OF CONTROL | | | | | | | | | | Percent of exposed workers having one or more controls | |
|----------------------------------|---------------------------|---|----------|---------------|------------------|------------|----------|---------------|--------------|---------------------|---------------------|--|-------|
| | | General ventilation | | Local exhaust | Enclosed process | Wet method | Gas mask | Respirator | | Air line respirator | Protective clothing | | Other |
| | | Positive | Negative | | | | | Approved type | Not approved | | | | |
| Organic dusts..... | 6,448 | | 3.8 | 58.3 | 0.8 | 0.2 | | 0.1 | 0.9 | | | | 61.9 |
| Silica dust..... | 1,534 | 0.7 | 8.3 | 46.7 | 0.1 | 0.7 | | 0.3 | 1.0 | | | | 51.6 |
| Dermatitis producers..... | 1,468 | | | | | | | | | | | | |
| Lacquers..... | 689 | | 2.2 | 66.9 | 0.6 | | | 3.0 | 13.9 | | 0.3 | | 67.5 |
| Organic solvents..... | 538 | | 2.7 | 38.0 | 0.2 | | | 2.2 | 6.7 | | 0.4 | | 41.8 |
| Silicate dusts..... | 513 | | 0.4 | 18.0 | | 8.2 | | 0.4 | | | | | 25.1 |
| Metals (N. O. S.)..... | 372 | | 0.5 | 8.9 | | 5.6 | | 1.3 | 0.3 | | | | 16.1 |
| Dyes..... | 352 | | 2.0 | 33.5 | 0.3 | | | 1.1 | 6.5 | | 0.6 | 0.9 | 36.1 |
| Paints..... | 337 | | 3.6 | 65.6 | 0.3 | 0.3 | | 3.6 | 16.0 | | 0.6 | | 66.8 |
| Non-siliceous dusts..... | 310 | | | 58.4 | | 2.3 | | 5.8 | 7.7 | | | | 61.3 |
| Petroleum products..... | 281 | | | 0.7 | | | | | | | | | 0.7 |
| Bituminous coal dust..... | 266 | | | | 0.8 | | | | | | | | 1.2 |
| Carbon monoxide..... | 255 | | | 5.3 | | | | | | | | | 6.3 |
| High humidity..... | 206 | | 1.0 | | | | | | | | | | |
| Sulphur dioxide..... | 203 | | | | | | | | | | | | |
| Gases (N. O. S.)..... | 159 | 3.1 | | 3.8 | | | | 1.9 | 3.8 | | | | 6.9 |
| Lead..... | 158 | | 2.5 | 6.3 | | 0.6 | | | | | | | 11.4 |
| Oil (not petroleum)..... | 144 | | 0.7 | 8.3 | | | | | 0.7 | | | 7.0 | 9.0 |
| Alcohols, esters and ethers..... | 57 | | 5.3 | 38.6 | | | | | 5.3 | | | | 50.9 |
| Extreme temperature changes..... | 53 | | | 18.9 | | | | | | | | | 18.9 |
| Mineral acids..... | 46 | | 2.2 | | | | | | | | 32.6 | | 32.6 |
| Inks..... | 37 | | | 29.7 | | | | | | | 39.3 | | 29.7 |
| Alkalis..... | 28 | | | | | | | | | | | | |
| Benzene..... | 23 | | | 17.4 | | | | | | | | | 17.4 |
| Antimony..... | 19 | | | 42.1 | | 5.3 | | | | | | | 47.4 |
| Cyanides..... | 19 | | | 5.3 | | | | | | | | 5.3 | 10.5 |
| Chromium..... | 12 | | | 58.3 | | | | | | | 25.0 | 5.3 | 58.3 |
| Coal tar products..... | 7 | | | 42.9 | | | | | | | | | 42.9 |
| Salts (N. O. S.)..... | 5 | | | | | | | | | | | | |
| Aldehydes..... | 5 | | | | | | | | | | | | |
| Cadmium..... | 5 | | | 80.0 | | | | | | | | | 80.0 |
| Aniline..... | 4 | | | | | | | | | | | 50.0 | 50.0 |
| Hydrogen sulphide..... | 4 | | | | | | | | | | | | |
| Chemicals (N. O. S.)..... | 3 | | | | | | | | | | | | |
| Medicinals..... | 3 | | | | | | | | | | | | |
| Infections..... | 2 | | | | | | | | | | | | |
| Sulphur..... | 2 | | | | | | | | | | | | |
| Accelerators..... | 2 | | | | | | | | | | | | |
| Anthrax coal dust..... | 2 | | | | | | | | | | | | |
| Chlorine..... | 1 | | | | | | | | | | | | |

(N. O. S.) Not otherwise specified.

•
PAPER, PRINTING
AND ALLIED
INDUSTRIES
•



Paper, Printing and Allied Industries

This classification is rather diversified as may be seen by referring to Table 44. Newspaper printing was the largest sub-group studied; this industry contributing 28.8% of the total number of workers.

Exposures: For the entire industry lead, inks, organic solvents and antimony were the major exposures tabulated. Since hard or soft lead type is extensively used in this industry it is not surprising to find lead leading the list. That lead is a problem in the printing industry is substantiated by Hepler²², when he finds lead concentrations of 1.63 mgs/10M³ about the linotype machines and breathing zone of the operators. Table 44 summarizes the rest of the findings.

Controls: Of the 1,841 workers exposed to lead 46.2% had some type of control. The control methods used for other materials may be seen by consulting Table 45.

TABLE 44—PAPER, PRINTING AND ALLIED INDUSTRIES

| MATERIAL | NUMBER AND PERCENT OF WORKERS IN EACH SUB GROUP EXPOSED TO SPECIFIED MATERIALS | | | | | | | | | | | | | | | | | | | | | |
|----------------------------------|--|------|-------------------------|------|----------------------|------|-------------|------|---------------------------------|------|--------------|------|--------------------------|------|----------------|------|--------------------|------|------------|------|---------------------------|------|
| | Total | | Wallpaper and wax paper | | Paper and pulp mills | | Paper boxes | | Other paper products (N. O. S.) | | Book binding | | Engraving and developing | | Litho-graphing | | Newspaper printing | | Stereotype | | Other Printing (N. O. S.) | |
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| TOTAL NUMBER ALL WORKERS..... | 12,075 | | 140 | 1.2 | 332 | 2.7 | 2,532 | 21.0 | 2,253 | 18.6 | 650 | 5.4 | 316 | 2.6 | 281 | 2.3 | 3,472 | 28.8 | 79 | 0.7 | 2,020 | 16.7 |
| Lead..... | 1,841 | 15.2 | | | | | | | | | | | | | | | | | | | | |
| Inks..... | 1,804 | 13.2 | 16 | 11.4 | 1 | 0.3 | 29 | 1.1 | 164 | 7.3 | 53 | 8.2 | 9 | 2.8 | 23 | 8.2 | 1,171 | 33.7 | 51 | 64.6 | 340 | 16.8 |
| Organic solvents..... | 1,529 | 12.7 | 13 | 9.3 | 6 | 1.8 | 232 | 9.2 | 258 | 11.5 | 81 | 12.5 | 46 | 14.6 | 72 | 25.6 | 447 | 12.9 | | | 446 | 22.1 |
| Antimony..... | 1,330 | 11.0 | | | 12 | 3.6 | 135 | 5.3 | 233 | 10.3 | 21 | 3.2 | 40 | 12.7 | 57 | 20.3 | 525 | 15.1 | 6 | 7.6 | 487 | 24.1 |
| Dermatitis producers..... | 732 | 6.1 | 7 | 5.0 | 11 | 3.3 | 201 | 7.9 | 98 | 4.3 | 42 | 6.5 | 1 | 0.3 | 22 | 7.8 | 918 | 26.4 | 15 | 19.0 | 234 | 11.6 |
| Organic dusts..... | 725 | 6.0 | | | 53 | 16.0 | 428 | 16.9 | 236 | 10.5 | 58 | 8.9 | 17 | 5.4 | 24 | 8.5 | 29 | 0.8 | 3 | 3.8 | 149 | 7.4 |
| Metals (N. O. S.)..... | 397 | 3.3 | | | 17 | 5.1 | 44 | 1.7 | 165 | 7.3 | 9 | 1.4 | 26 | 8.2 | 2 | 0.7 | 22 | 0.6 | | | | |
| Petroleum products..... | 327 | 2.7 | 27 | 19.3 | 5 | 1.5 | 116 | 4.6 | 35 | 1.6 | 20 | 3.1 | 84 | 26.6 | 20 | 7.1 | 115 | 3.3 | 11 | 14.0 | 39 | 1.9 |
| Gases (N. O. S.)..... | 267 | 2.2 | | | 30 | 9.0 | 118 | 4.8 | 11 | 0.5 | 4 | 0.6 | 6 | 1.9 | 14 | 5.0 | 35 | 1.0 | 3 | 3.8 | 69 | 3.4 |
| High humidity..... | 255 | 2.1 | 7 | 5.0 | 44 | 13.3 | 114 | 4.5 | 79 | 3.5 | | | 1 | 0.3 | | | 10 | 0.3 | | | 18 | 0.9 |
| Silicate dusts..... | 167 | 1.4 | 4 | 2.9 | 7 | 2.1 | 72 | 2.8 | 26 | 1.2 | 6 | 0.9 | 28 | 8.9 | | | 15 | 0.4 | | | | |
| Chemicals (N. O. S.)..... | 116 | 1.0 | | | 1 | 0.3 | | | 4 | 0.2 | | | 58 | 18.4 | 28 | 10.0 | 17 | 0.5 | | | 8 | 0.4 |
| Carbon monoxide..... | 109 | 0.9 | | | 8 | 2.4 | 40 | 1.6 | 16 | 0.7 | 3 | 0.5 | 1 | 0.3 | 1 | 0.4 | 23 | 0.7 | | | 17 | 0.8 |
| Dyes..... | 91 | 0.8 | 28 | 20.0 | 7 | 2.1 | 10 | 0.4 | 25 | 1.1 | | | 2 | 0.6 | 11 | 3.9 | | | | | 9 | 0.4 |
| Bituminous coal dust..... | 89 | 0.7 | | | | | 5 | 0.2 | 6 | 0.3 | | | | | | | 7 | 0.2 | | | 6 | 0.3 |
| Mineral acids..... | 83 | 0.7 | | | | | 45 | 1.6 | 28 | 1.2 | | | | | | | 15 | 0.4 | | | 4 | 0.2 |
| Non-siliceous dusts..... | 67 | 0.6 | | | 1 | 0.3 | 46 | 1.8 | 8 | 0.4 | | | 43 | 13.6 | 10 | 3.6 | | | | | 5 | 0.2 |
| Sulphur dioxide..... | 66 | 0.5 | | | 7 | 2.1 | 39 | 1.5 | 2 | 0.2 | | | | | | | 7 | 0.2 | | | 5 | 0.2 |
| Alkalis..... | 63 | 0.5 | | | | | 33 | 1.3 | 16 | 0.7 | | | | | | | 4 | 0.1 | | | | |
| Oil (not petroleum)..... | 58 | 0.5 | | | | | 4 | 0.2 | 4 | 0.2 | | | | | | | 10 | 0.3 | 3 | 3.8 | 18 | 0.9 |
| Paints..... | 53 | 0.4 | | | | | 2 | 0.3 | 3 | 0.1 | | | | | | | 18 | 0.5 | | | 23 | 1.1 |
| Benzene..... | 51 | 0.4 | | | | | 7 | 0.3 | 4 | 0.2 | | | | | | | 14 | 0.4 | 1 | 1.3 | 2 | 0.1 |
| Organic acids..... | 48 | 0.4 | 1 | 0.7 | | | 15 | 0.6 | 1 | * | | | | | | | 9 | 0.3 | | | 11 | 0.5 |
| Alcohols, esters and ethers..... | 46 | 0.4 | | | | | 32 | 1.3 | | | | | | | | | 10 | 0.3 | | | 14 | 0.7 |
| Extreme temperature changes..... | 36 | 0.3 | | | 4 | 1.2 | 6 | 0.2 | | | | | | | | | 8 | 0.2 | | | 6 | 0.3 |
| Lacquers..... | 34 | 0.3 | | | 2 | 0.6 | 5 | 0.2 | 3 | 0.1 | | | | | | | 2 | 0.3 | | | 2 | 0.1 |
| Aniline..... | 20 | 0.2 | | | | | | | | | | | | | | | | | | | | |
| Salts (N. O. S.)..... | 19 | 0.2 | 6 | 4.3 | 9 | 2.7 | | | | | | | | | | | 5 | 0.1 | | | | |
| Cyanides..... | 14 | 0.1 | | | | | | | 4 | 0.2 | | | | | | | | | | | | |
| Aldehydes..... | 13 | 0.1 | | | | | 12 | 0.5 | | | | | | | | | | | | | | |
| Silica dust..... | 12 | 0.1 | | | | | 4 | 0.2 | | | | | | | | | 1 | 0.1 | | | | |
| Coal tar products..... | 11 | * | | | | | | | 8 | 0.4 | 2 | 0.3 | | | | | | | | | 2 | 0.1 |
| Chromium..... | 9 | * | | | | | | | | | | | | | | | | | | | | |
| Halogenated hydrocarbons..... | 6 | * | | | | | | | | | | | | | | | | | | | | |
| Sulphur..... | 4 | * | | | | | | | | | | | | | | | | | | | | |
| Mercury..... | 3 | * | | | | | | | | | | | | | | | | | | | | |
| Medicinals..... | 1 | * | | | | | | | | | | | | | | | | | | | | |

*Less than 0.1%
(N. O. S.) Not otherwise specified.

TABLE 45—PAPER, PRINTING AND ALLIED—CONTROLS
272 Plants—12,075 Employees

| MATERIAL | Number of workers exposed | PERCENT OF EXPOSED WORKERS HAVING INDICATED TYPE OF CONTROL | | | | | | | | | | Percent of exposed workers having one or more controls | | | |
|-----------------------------------|---------------------------|---|----------|---------------|------------------|------------|----------|---------------|--------------|---------------------|---------------------|--|-------|-----|------|
| | | General ventilation | | Local exhaust | Enclosed process | Wet method | Gas mask | Respirator | | Air line respirator | Protective clothing | | Other | | |
| | | Positive | Negative | | | | | Approved type | Not approved | | | | | | |
| Lead..... | 1,841 | 3.0 | 31.3 | 24.2 | 5.3 | | | | | | | | | 0.3 | 46.2 |
| Inks..... | 1,604 | 2.4 | 5.7 | 3.1 | | | | | | | | | | | 10.5 |
| Organic solvents..... | 1,529 | 2.2 | 14.4 | 2.4 | 0.2 | | | | | | | 0.1 | | | 18.2 |
| Antimony..... | 1,330 | 0.6 | 26.1 | 26.4 | 6.3 | | | | | | | | | | 44.3 |
| Dermatitis producers..... | 732 | | | | | | | | | | | | | | |
| Organic dusts..... | 725 | | 5.7 | 4.3 | 0.4 | 1.4 | | 0.1 | | 0.3 | | | | | 11.6 |
| Metals (N. O. S.)..... | 397 | 11.6 | 31.0 | 12.3 | 2.8 | 5.8 | | | | | | 0.5 | | | 43.3 |
| Petroleum products..... | 327 | | | 2.4 | 1.8 | | | | | | | | | | 3.1 |
| Gases (N. O. S.)..... | 267 | 1.9 | 30.0 | 49.8 | 0.7 | | | | | | | | 1.9 | | 57.0 |
| High humidity..... | 255 | 11.8 | 38.8 | 12.2 | | | 0.6 | | | | | | | | 47.1 |
| Silicate dusts..... | 167 | | 15.6 | 18.6 | | | | | | | | | | | 25.7 |
| Chemicals (N. O. S.)..... | 116 | | 8.6 | 9.5 | | | | | | | | | | | 13.8 |
| Carbon monoxide..... | 109 | 4.6 | 12.8 | 4.6 | 2.8 | | | | | | | | | 4.6 | 20.2 |
| Dyes..... | 91 | | | 6.6 | | | | | | | | | | | 6.6 |
| Bituminous coal dust..... | 89 | | 4.5 | | | | | | | | | | | | 4.5 |
| Mineral acids..... | 83 | | 26.5 | 54.2 | 6.0 | | | | | | | 7.2 | | | 68.7 |
| Non-siliceous dusts..... | 67 | | 3.0 | 7.5 | | 6.0 | | | | | | | | | 16.4 |
| Sulphur dioxide..... | 66 | | 6.1 | | 4.5 | | | | | | | | | | 10.6 |
| Alkalis..... | 63 | | 1.6 | | | 1.6 | | | | | | | 6.3 | | 7.9 |
| Oil (not petroleum)..... | 58 | | | | | | | | | | | | 1.7 | | 6.9 |
| Paints..... | 53 | 13.2 | 1.9 | 7.5 | | | | | | | 1.9 | | | | 20.8 |
| Benzene..... | 51 | | 7.9 | 13.7 | | | | | | | | | | | 21.6 |
| Organic acids..... | 48 | | 25.0 | 31.3 | | | | | | | | | | | 35.4 |
| Alcohols, esthers and ethers..... | 46 | | 2.2 | 4.3 | | | | | | | | | | | 6.5 |
| Extreme temperature changes..... | 35 | | 83.3 | 83.3 | | | | | | | | | | | 83.3 |
| Lacquers..... | 34 | 83.3 | | 55.9 | 5.9 | | | 8.8 | 2.9 | | | | | | 61.8 |
| Aniline..... | 20 | | 8.8 | 10.0 | | | | | | | | | | | 10.0 |
| Salts (N. O. S.)..... | 19 | | | | | | | | | | | | | | 28.6 |
| Cyanides..... | 14 | | | 28.6 | | | | | | | | | | | 15.4 |
| Aldehydes..... | 13 | | 7.7 | 7.7 | | | | | | | | 7.7 | | | |
| Silica dust..... | 12 | | | | | | | | | | | | | | |
| Coal tar products..... | 11 | | | | | | | | | | | | | | |
| Chromium..... | 9 | | | | | | | | | | | | | | |
| Halogenated hydrocarbons..... | 6 | | | | | | | | | | | | | | |
| Sulphur..... | 4 | | 50.0 | | | | | | | | | | | | 50.0 |
| Mercury..... | 3 | | 66.7 | | | | | | | | | | | | 66.7 |
| Medicinals..... | 1 | | | | | | | | | | | | | | |

(N. O. S.) Not otherwise specified.

•

**TEXTILE
MANUFACTURING**

•

Textile Industry

Exposures: Organic dusts and high humidity appeared to be the most important of the materials to which exposures were attributed in the industry. (See Table 46.) This industry is rather large in Indiana due to the fact that several large silk hosiery plants are located in the State. 71.7% of the workers surveyed for this group were in the knitting mills.

Controls: General ventilation was used most frequently to control exposures to organic dusts and high humidity. For control measures of other materials see Table 47.

TABLE 46—TEXTILE INDUSTRIES

| MATERIAL | NUMBER AND PERCENT OF WORKERS IN EACH INDUSTRIAL SUB GROUP EXPOSED TO SPECIFIED MATERIAL | | | | | | | | | | | | | |
|-----------------------------------|--|------|----------------|------|--|------|--------------------------|------|----------------------|------|-----------------|------|---------------------------|------|
| | Total | | Knitting mills | | Textile dyeing, finishing and printing | | Woolen and worsted mills | | Hemp, jute and linen | | Tent and awning | | Other textiles (N. O. S.) | |
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| TOTAL NUMBER WORKERS EMPLOYED.... | 8,232 | | 5,903 | 71.7 | 696 | 8.4 | 600 | 7.4 | 24 | 0.3 | 230 | 2.8 | 770 | 9.4 |
| Organic dusts..... | 3,751 | 45.6 | 2,489 | 42.2 | 562 | 80.7 | 361 | 59.3 | 17 | 70.8 | 31 | 13.5 | 291 | 37.8 |
| High humidity..... | 2,734 | 33.2 | 2,216 | 37.5 | 391 | 56.2 | 117 | 19.2 | 6 | 25.0 | | | 4 | 0.5 |
| Petroleum products..... | 523 | 6.4 | 469 | 7.9 | 22 | 3.2 | 4 | 0.7 | | | 7 | 3.0 | 21 | 2.7 |
| Dermatitis producers..... | 330 | 4.0 | 210 | 3.6 | 12 | 1.7 | | | | | 4 | 1.7 | 104 | 13.5 |
| Dyes..... | 230 | 2.8 | 198 | 3.4 | | | 32 | 5.3 | | | | | | |
| Carbon monoxide..... | 48 | 0.6 | 20 | 0.3 | 12 | 1.7 | 9 | 1.5 | | | 1 | 0.4 | 6 | 0.8 |
| Metals (N. O. S.)..... | 44 | 0.5 | 19 | 0.3 | 6 | 0.9 | 2 | 0.3 | | | 6 | 2.6 | 11 | 1.4 |
| Silicate dusts..... | 43 | 0.5 | 14 | 0.2 | 6 | 0.9 | 9 | 1.5 | | | 6 | 2.6 | 8 | 1.0 |
| Organic solvents..... | 43 | 0.5 | 24 | 0.4 | | | | | 2 | 8.3 | 3 | 1.3 | 14 | 1.8 |
| Alkalis..... | 41 | 0.5 | 19 | 0.3 | 2 | 0.3 | 16 | 2.6 | | | | | 4 | 0.5 |
| Bituminous coal dust..... | 40 | 0.5 | 14 | 0.2 | 10 | 1.4 | 9 | 1.5 | | | 1 | 0.4 | 6 | 0.8 |
| Sulphur dioxide..... | 29 | 0.4 | 14 | 0.2 | | | 9 | 1.5 | | | | | 6 | 0.8 |
| Non-siliceous dusts..... | 29 | 0.4 | 16 | 0.3 | 4 | 0.6 | | | | | | | 9 | 1.2 |
| Aniline..... | 28 | 0.3 | 7 | 0.1 | | | 21 | 3.4 | | | | | | |
| Inks..... | 27 | 0.3 | 18 | 0.3 | 1 | 0.1 | | | 2 | 8.3 | 6 | 2.6 | | |
| Infections..... | 26 | 0.3 | 5 | * | | | 10 | 1.6 | | | | | 11 | 1.4 |
| Gases (N. O. S.)..... | 25 | 0.3 | 10 | 0.2 | 12 | 1.7 | | | | | 3 | 1.3 | | |
| Mineral acids..... | 25 | 0.3 | 2 | * | 5 | 0.7 | 18 | 3.0 | | | | | | |
| Lead..... | 18 | 0.2 | 13 | 0.2 | 2 | 0.3 | 2 | 0.3 | | | 1 | 0.4 | | |
| Chemicals (N. O. S.)..... | 16 | 0.2 | 12 | 0.2 | 1 | 0.1 | | | | | | | 3 | 0.4 |
| Lacquers..... | 12 | 0.1 | | | | | | | | | 10 | 4.3 | 2 | 0.3 |
| Salts (N. O. S.)..... | 12 | 0.1 | 6 | 0.1 | | | | | 6 | 25.0 | | | | |
| Oil (not petroleum)..... | 11 | 0.1 | 4 | * | | | 2 | 0.3 | | | 1 | 0.4 | 4 | 0.5 |
| Halogenated hydrocarbons..... | 11 | 0.1 | 7 | 0.1 | | | | | | | | | 4 | 0.5 |
| Paints..... | 7 | * | 1 | * | 2 | 0.3 | | | | | 4 | 1.7 | | |
| Extreme temperature changes..... | 5 | * | 2 | * | | | 3 | 0.5 | | | | | | |
| Medicinals..... | 5 | * | 5 | * | | | | | | | | | | |
| Chlorine..... | 3 | * | 3 | * | | | | | | | | | | |
| Organic acids..... | 2 | * | 1 | * | | | 1 | 0.2 | | | | | | |
| Alcohols, esters and ethers..... | 2 | * | 2 | * | | | | | | | | | | |
| Silica dust..... | 1 | * | 1 | * | | | | | | | | | | |
| Antimony..... | 1 | * | 1 | * | | | | | | | | | | |

*Less than 0.1%
(N. O. S.) Not otherwise specified.

TABLE 47—TEXTILE INDUSTRIES—CONTROLS
51 Plants—8,232 Employees

| MATERIAL | Number of workers exposed | PERCENT OF EXPOSED WORKERS HAVING INDICATED TYPE OF CONTROL | | | | | | | | | | Percent of exposed workers having one or more controls ¹ | |
|----------------------------------|---------------------------|---|----------|---------------|------------------|------------|----------|---------------|--------------|---------------------|---------------------|---|-------|
| | | General ventilation | | Local exhaust | Enclosed process | Wet method | Gas mask | Respirator | | Air line respirator | Protective clothing | | Other |
| | | Positive | Negative | | | | | Approved type | Not approved | | | | |
| Organic dusts..... | 3,751 | 0.1 | 10.8 | 0.5 | 0.2 | 0.2 | | | 0.2 | | | | 11.6 |
| High humidity..... | 2,734 | 0.6 | 19.2 | 3.8 | | | | | | | 0.7 | | 23.6 |
| Petroleum products..... | 523 | | | | | | | | | | | | |
| Dermatitis producers..... | 330 | | | | | | | | | | | | |
| Dyes..... | 230 | | 13.0 | | 0.4 | | | | 0.4 | | | | 13.9 |
| Carbon monoxide..... | 48 | | | 2.1 | | | | | | | | | 2.1 |
| Metals (N. O. S.)..... | 44 | | | 4.5 | | 6.8 | | | | | | | 11.4 |
| Silicate dusts..... | 43 | | | | | | | | | | 4.7 | | 4.7 |
| Organic solvents..... | 43 | | 4.7 | 9.3 | 9.8 | | | | 4.7 | | | | 14.0 |
| Alkalis..... | 41 | | | 9.8 | | | | | | | | | 9.8 |
| Bituminous coal dust..... | 40 | | | | | | | | | | | | |
| Sulphur dioxide..... | 39 | | | | | | | | | | | | |
| Non-siliceous dusts..... | 29 | | | 3.4 | | | | | | | | | 3.4 |
| Aniline..... | 28 | | 14.3 | | | | | | | | | | 14.3 |
| Inks..... | 27 | | | | | | | | | | | | |
| Infections..... | 26 | | 19.2 | 19.2 | | | | | | | | | 19.2 |
| Gases (N. O. S.)..... | 25 | | 16.0 | | | | | | | | | | 16.0 |
| Mineral acids..... | 25 | | | 16.0 | 16.0 | | | | | | | | 16.0 |
| Lead..... | 18 | | | | | | | | | | | | |
| Chemicals (N. O. S.)..... | 16 | | 50.0 | | | | | | | | | | 50.0 |
| Lacquers..... | 12 | 12.5 | | | | | | | | | | | 25.0 |
| Salts (N. O. S.)..... | 12 | | 50.0 | 25.0 | | | | | | | | | 50.0 |
| Oil (not petroleum)..... | 11 | | | | | | | | | | | | |
| Halogenated hydrocarbons..... | 11 | | 9.1 | 9.1 | | | | | | | | | 63.6 |
| Paints..... | 7 | 54.5 | 28.6 | | | | | | 28.6 | | | | 28.6 |
| Extreme temperature changes..... | 5 | | | 20.0 | | | | | | | | | 20.0 |
| Medicinals..... | 5 | | | | | | | | | | | | |
| Chlorine..... | 3 | | 100.0 | | | | | | | | | | |
| Organic acids..... | 2 | | | | | | | | | | | | |
| Alcohols, esters and ethers..... | 2 | | | | | | | | | | | | |
| Silica dust..... | 1 | | | | | | | | | | | | |
| Antimony..... | 1 | | | | | | | | | | | | 100.0 |

(N. O. S.) Not otherwise specified.

•
MISCELLANEOUS
MANUFACTURING
•

Miscellaneous Manufacturing Industries

This group is a heterogenous group made up of 14 sub-groups. Industries falling into this group would not lend themselves to the specifications of our previously discussed classifications.

Exposures: The principal exposures encountered in this classification were to metals (N. O. S.), organic dusts, and dermatitis producers. Metallic dusts were high in the electrical supply industries while organic dusts were high in the broom and brush, as well as the rubber, strawboard, dental appliance and hairgoods industries. Dermatitis producers were concentrated in the broom and brush industries, electrical machinery, rubber and optical glass industries. (See Table 48.)

Controls: Controls reported for various material exposures are listed in Table 49. It may be seen that 51% of the workers exposed to metals (N. O. S.) had one or more controls listed.

Rubber Industry; Occupational Analysis: Organic dusts, dermatitis producers, high humidity and silicate dusts are listed as major material exposures in the rubber industry in Table 50. In addition the distribution of the material exposures among the various occupations is noted in this same table.

TABLE 48—MISCELLANEOUS MANUFACTURING AND MECHANICAL

NUMBER AND PERCENT OF WORKERS IN EACH SUB GROUP EXPOSED TO SPECIFIED MATERIALS

| MATERIAL | Total | | Broom and brush | | Buttons | | B t rises | | Lamps and fixtures | | Electric machinery and supply | Rubber | Straw and straw-board | Dental appliances | Signs non-electric | Toys and novelties | Hair-goods, and artificial flowers | Lenses | Lamp and window shades | Other non-specified |
|----------------------------------|--------|------|-----------------|------|---------|------|-----------|------|--------------------|------|-------------------------------|--------|-----------------------|-------------------|--------------------|--------------------|------------------------------------|--------|------------------------|---------------------|
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| TOTAL NUMBER ALL WORKERS..... | 21,822 | .... | 342 | 1.6 | 105 | 0.5 | 880 | 3.9 | 1,990 | 9.1 | 7,617 | 34.9 | 8,801 | 40.3 | 499 | 2.3 | 43 | 0.2 | 160 | 0.7 |
| Metals (N. O. S.)..... | 2,835 | 13.0 | 1 | 0.3 | 3 | 2.9 | 53 | 6.2 | 478 | 24.0 | 1,521 | 20.0 | 572 | 6.5 | 9 | 1.8 | 25 | 10.2 | 233 | 1.1 |
| Organic dusts..... | 2,182 | 10.0 | 167 | 8.8 | .... | .... | 11 | 1.3 | 45 | 2.3 | 1,141 | 15.1 | 1,384 | 15.8 | 6 | 1.8 | 10 | 23.3 | 510 | 4.2 |
| Dermatitis producers..... | 2,088 | 9.6 | 36 | 10.5 | 4 | 3.8 | 63 | 7.4 | 37 | 1.9 | 765 | 10.0 | 950 | 11.1 | 1 | 0.2 | 17 | 39.5 | 97 | 0.5 |
| Lead..... | 1,605 | 7.4 | 2 | 0.6 | .... | .... | 484 | 56.9 | 15 | 0.8 | 913 | 12.0 | 11 | 0.2 | 11 | 6.9 | 92 | 36.4 | 45 | 19.3 |
| Silicate dusts..... | 1,534 | 6.1 | 3 | 0.9 | 1 | 1.0 | .... | .... | 57 | 4.4 | 396 | 4.4 | 715 | 8.1 | 7 | 4.4 | 38 | 6.1 | 1 | 0.4 |
| High humidity..... | 1,135 | 5.2 | .... | .... | 4 | 3.8 | 5 | 0.6 | 27 | 1.4 | 2 | .... | 898 | 10.2 | .... | .... | 5 | 2.0 | 86 | 36.9 |
| Non-silicious dusts..... | 1,070 | 4.9 | 1 | 0.3 | 94 | 89.5 | 24 | 2.8 | 243 | 12.2 | 200 | 2.6 | 362 | 4.1 | 30 | 6.0 | 3 | 3.7 | 67 | 28.8 |
| Gases (N. O. S.)..... | 930 | 4.3 | 1 | 0.3 | .... | .... | 45 | 5.3 | 107 | 5.4 | 531 | 7.0 | 146 | 1.7 | 32 | 6.4 | 17 | 6.7 | 3 | 1.3 |
| Petroleum products..... | 649 | 3.0 | 6 | 1.8 | .... | .... | 65 | 7.6 | 105 | 5.3 | 296 | 3.9 | 102 | 1.2 | 52 | 10.4 | 2 | 0.3 | 3 | 1.3 |
| Extreme temperature changes..... | 480 | 2.2 | .... | .... | .... | .... | 7 | 0.8 | 87 | 4.4 | 67 | 0.9 | 232 | 2.6 | 32 | 6.4 | 3 | 1.9 | 36 | 5.9 |
| Organic solvents..... | 471 | 2.2 | 2 | 0.6 | .... | .... | 2 | 0.2 | 81 | 4.1 | 99 | 1.3 | 232 | 2.6 | .... | .... | 4 | 0.6 | 3 | 1.2 |
| Mineral acids..... | 442 | 2.0 | .... | .... | .... | .... | 74 | 8.7 | 104 | 5.2 | 106 | 1.4 | 126 | 1.4 | 28 | 5.6 | .... | .... | 19 | 11.9 |
| Alkalis..... | 379 | 1.7 | .... | .... | .... | .... | 8 | 0.9 | 116 | 5.8 | 111 | 1.5 | 124 | 1.4 | 10 | 2.0 | .... | .... | 3 | 1.9 |
| Carbon monoxide..... | 295 | 1.4 | 3 | 0.9 | 1 | 1.0 | 16 | 1.9 | 5 | 0.3 | 117 | 1.5 | 84 | 1.0 | 21 | 4.2 | .... | .... | 4 | 2.5 |
| Lacquers..... | 271 | 1.2 | 10 | 2.9 | .... | .... | 5 | 0.6 | 6 | 0.3 | 58 | 0.8 | 112 | 1.3 | .... | .... | 4 | 2.5 | 4 | 2.5 |
| Silica dust..... | 260 | 1.2 | 8 | 2.3 | .... | .... | 4 | 0.5 | 2 | 0.1 | 108 | 1.4 | 73 | 0.8 | .... | .... | 4 | 2.5 | 7 | 1.1 |
| Sulphur..... | 221 | 1.0 | 8 | 2.3 | .... | .... | 40 | 4.7 | .... | .... | 2 | .... | 161 | 1.8 | .... | .... | .... | .... | 4 | 2.5 |
| Paints..... | 207 | 0.9 | 2 | 0.6 | .... | .... | 7 | 0.8 | 32 | 1.6 | 89 | 1.2 | 14 | 0.2 | .... | .... | .... | .... | 29 | 18.1 |
| Sulphur dioxide..... | 185 | 0.9 | 10 | 2.8 | 1 | 1.0 | 60 | 7.1 | 4 | 0.2 | 34 | 0.4 | 50 | 0.6 | .... | .... | .... | .... | 4 | 2.5 |
| Bituminous coal dust..... | 182 | 0.8 | 3 | 0.9 | 1 | 1.0 | .... | .... | 23 | 1.2 | 39 | 0.5 | 72 | 0.8 | .... | .... | .... | .... | 4 | 2.5 |
| Coal tar products..... | 170 | 0.8 | .... | .... | .... | .... | 9 | 1.1 | .... | .... | 162 | 2.1 | 1 | .... | .... | .... | .... | .... | .... | .... |
| Infections..... | 172 | 0.8 | 73 | 21.3 | .... | .... | .... | .... | 4 | 0.2 | .... | .... | 53 | 10.6 | .... | .... | .... | .... | .... | .... |
| Accelerators..... | 169 | 0.8 | .... | .... | .... | .... | .... | .... | .... | .... | .... | 169 | 1.9 | .... | .... | .... | .... | .... | .... | .... |
| Chemicals..... | 156 | 0.7 | 5 | 1.5 | .... | .... | 20 | 2.4 | 2 | 0.1 | 9 | 0.1 | 115 | 1.3 | .... | .... | .... | .... | .... | .... |
| Cyanides..... | 129 | 0.6 | .... | .... | .... | .... | 70 | 3.5 | 70 | 3.5 | 43 | 0.6 | 15 | 0.2 | .... | .... | .... | .... | .... | .... |
| Halogenated hydrocarbons..... | 106 | 0.5 | 4 | 1.2 | .... | .... | .... | .... | 7 | 0.4 | 95 | 1.2 | .... | .... | .... | .... | .... | .... | .... | .... |
| Oil (not petroleum)..... | 101 | 0.5 | 3 | 0.9 | .... | .... | .... | .... | .... | .... | 41 | 0.5 | 41 | 0.5 | .... | .... | .... | .... | .... | .... |
| Chromium..... | 98 | 0.4 | .... | .... | .... | .... | .... | .... | 38 | 1.9 | 55 | 0.7 | 3 | .... | .... | .... | .... | .... | .... | .... |
| Alcohols, esters and ethers..... | 80 | 0.4 | .... | .... | .... | .... | .... | .... | 1 | .... | 48 | 0.6 | 30 | 0.3 | .... | .... | .... | .... | .... | .... |
| Dyes..... | 79 | 0.4 | 8 | 2.3 | .... | .... | .... | .... | 2 | 0.1 | 4 | .... | 40 | 0.5 | .... | .... | .... | .... | .... | .... |
| Cadmium..... | 46 | 0.2 | .... | .... | .... | .... | .... | .... | .... | .... | 46 | 0.6 | .... | .... | .... | .... | .... | .... | .... | .... |
| Inks..... | 35 | 0.2 | .... | .... | .... | .... | 5 | 0.6 | 4 | 0.2 | 3 | .... | 16 | 0.2 | .... | .... | .... | .... | .... | .... |
| Organic acids..... | 35 | 0.2 | .... | .... | .... | .... | .... | .... | .... | .... | 8 | 0.1 | 22 | 0.2 | .... | .... | .... | .... | .... | .... |
| Aniline..... | 33 | 0.2 | 8 | 2.3 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Salts (N. O. S.)..... | 19 | .... | .... | .... | .... | .... | 9 | 1.1 | 8 | 0.4 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Antimony..... | 17 | .... | .... | .... | .... | .... | 1 | 0.1 | 6 | 0.3 | 5 | .... | 3 | .... | .... | .... | .... | .... | .... | .... |
| Medicinals..... | 15 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Benzene..... | 11 | .... | .... | .... | .... | .... | 1 | 0.1 | .... | .... | 18 | 0.2 | 1 | .... | .... | .... | .... | .... | .... | .... |
| Mercury..... | 6 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Arsenic..... | 2 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Fluorides..... | 2 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Manganese..... | 2 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Asbestos dust..... | 1 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |

*Less than 0.1% (N. O. S.) Not otherwise specified.

TABLE 49—MISCELLANEOUS MANUFACTURING—CONTROLS
134 Plants—21,822 Employees

| MATERIAL | Number of workers exposed | PERCENT OF EXPOSED WORKERS HAVING INDICATED TYPE OF CONTROL | | | | | | | | | | Percent of exposed workers having one or more controls | |
|----------------------------------|---------------------------|---|----------|---------------|------------------|------------|----------|---------------|--------------|---------------------|---------------------|--|-------|
| | | General ventilation | | Local exhaust | Enclosed process | Wet method | Gas mask | Respirator | | Air line respirator | Protective clothing | | Other |
| | | Positive | Negative | | | | | Approved type | Not approved | | | | |
| Metals (N. O. S.)..... | 2,836 | 7.8 | 17.7 | 29.6 | 2.4 | 16.7 | | 0.1 | 0.2 | | 0.1 | | 51.3 |
| Organic dusts..... | 2,182 | 0.4 | 8.7 | 27.9 | 1.7 | 3.6 | | | 2.0 | | | | 37.9 |
| Dermatitis producers..... | 2,088 | | | | | | | | | | | | 1.7 |
| Lead..... | 1,605 | 0.2 | 2.2 | 13.8 | 5.2 | 7.7 | | 0.7 | 3.9 | | 1.3 | 0.4 | 20.5 |
| Silicate dusts..... | 1,334 | 6.7 | 4.3 | 24.7 | 5.2 | 12.1 | | | | | | | 43.1 |
| High humidity..... | 1,135 | 1.9 | 17.4 | 10.2 | 1.9 | | | | | | | 2.3 | 25.0 |
| Non-siliceous dusts..... | 1,070 | 5.0 | 17.5 | 41.0 | 0.2 | 26.3 | | | 4.7 | | | | 73.4 |
| Gases (N. O. S.)..... | 930 | 4.5 | 18.7 | 17.7 | 5.8 | | 0.4 | | 3.7 | | | 1.3 | 26.2 |
| Petroleum products..... | 649 | 0.6 | 2.5 | 2.9 | | | | | | | | | 4.8 |
| Extreme temperature changes..... | 480 | 13.1 | 32.5 | 13.5 | 5.3 | | | 0.2 | | | 5.6 | 17.1 | 55.6 |
| Organic solvents..... | 471 | 8.3 | 24.6 | 25.7 | 4.5 | | | 0.5 | | | 0.4 | | 37.8 |
| Mineral acids..... | 442 | 2.3 | 29.0 | 33.7 | 4.5 | | | 0.5 | 1.6 | | 20.4 | 2.9 | 53.6 |
| Alkalis..... | 379 | 0.5 | 33.8 | 31.7 | 9.0 | | | | | | 10.0 | | 48.8 |
| Carbon monoxide..... | 295 | | 1.4 | 4.7 | 0.3 | | | | 2.0 | | | | 6.4 |
| Lacquers..... | 271 | 0.4 | 1.8 | 52.8 | 0.7 | | | | 6.3 | | 0.7 | | 54.2 |
| Silica dust..... | 260 | 5.0 | 10.8 | 59.6 | 22.7 | 26.5 | | 1.2 | 1.5 | | | | 80.4 |
| Sulphur..... | 221 | | 39.4 | 34.8 | 0.9 | | | | | | | | 52.0 |
| Paints..... | 207 | 10.6 | 10.1 | 56.0 | 4.8 | | | 1.4 | 8.2 | | | | 61.4 |
| Sulphur dioxide..... | 185 | | 14.9 | | 1.0 | | | | | | | | 15.9 |
| Bituminous coal dust..... | 182 | | | | | | | | | | | | 4.4 |
| Coal tar products..... | 172 | 0.6 | 4.1 | 88.4 | 4.4 | | | | | | | | 91.9 |
| Infections..... | 170 | | | | | | | | | | | | 78.1 |
| Accelerators..... | 169 | | 35.5 | 60.4 | | | | | | | | | 5.8 |
| Chemicals (N. O. S.)..... | 156 | | | 3.2 | 2.6 | | | | | | 1.6 | 15.5 | 76.0 |
| Cyanides..... | 129 | | 56.6 | 70.5 | 7.8 | | | | | | | | 21.7 |
| Halogenated hydrocarbons..... | 106 | | 6.6 | 17.9 | 3.8 | | | | | | | | 27.7 |
| Oil (not petroleum)..... | 101 | | 1.0 | 24.8 | | | | | 3.1 | | 2.0 | | 95.9 |
| Chromium..... | 98 | | 2.0 | 89.9 | | 2.0 | | | | | 5.1 | | 21.3 |
| Alcohols, esters and ethers..... | 80 | 2.5 | 3.8 | 18.8 | | | | | | | 2.5 | | 41.8 |
| Dyes..... | 79 | | 6.3 | 25.3 | 2.5 | | | | | | 11.4 | | 73.9 |
| Cadmium..... | 46 | | 10.9 | 63.0 | | | | | | | 8.7 | | 11.4 |
| Inks..... | 35 | | 11.4 | 11.4 | | | | | | | | | 37.1 |
| Organic acids..... | 35 | | 17.1 | | | | | | | | 20.0 | | 15.2 |
| Aniline..... | 33 | | | 3.0 | | | | | | | 12.1 | | |
| Salts (N. O. S.)..... | 19 | | | | | | | | | | | | |
| Antimony..... | 17 | | | | | | | | | | | | |
| Medicinals..... | 15 | | | | | | | | | | | | |
| Benzene..... | 11 | | | | | | | | 9.1 | | | | 9.1 |
| Mercury..... | 6 | | | 33.3 | | | | | | | 33.3 | | 33.3 |
| Arsenic..... | 2 | | 100.0 | 100.0 | | | | | 100.0 | | | | 100.0 |
| Fluorides..... | 2 | | 100.0 | 100.0 | | | | | 100.0 | | | | 100.0 |
| Manganese..... | 2 | | 100.0 | 100.0 | | | | | 100.0 | | | | 100.0 |
| Asbestos..... | 1 | | | | | | | | | | | | |

(N. O. S.) Not otherwise specified.

TABLE 50—RUBBER INDUSTRY:
MATERIAL EXPOSURE BY OCCUPATION

Survey Data: 21 Plants; 8,801 Employees; 4,267 Employees were given 7,088 Exposures

| OCCUPATION | NUMBER OF WORKERS EXPOSED TO SPECIFIED MATERIALS BY OCCUPATION | | | | | | | | | | | | | | | |
|---|--|----------------------|---------------|----------------|-------------------|---------------------|-----------------------------|------------------|--------------|---------|------|------------------|---------------|---------|-----------|----------|
| | Organic dusts ² | Dermatitis producers | High humidity | Silicate dusts | Metals (N. O. S.) | Non-siliceous dusts | Extreme temperature changes | Organic solvents | Accelerators | Sulphur | Lead | Gases (N. O. S.) | Mineral acids | Alkalis | Chemicals | Lacquers |
| TOTAL NUMBER OF WORKERS EXPOSED | 1,394 | 980 | 898 | 715 | 572 | 362 | 232 | 232 | 169 | 161 | 155 | 146 | 126 | 124 | 115 | 112 |
| Rubber cutters, slitters, trimmers, punchers | 154 | 301 | 6 | 90 | 25 | 6 | | | | | | | | 96 | | |
| Buffers, polishers, finishers..... | 135 | | | 58 | | 58 | | | | | | | | | | |
| Calendar operators..... | 113 | 4 | 3 | 1 | 1 | 55 | | | | | | | | | | |
| Grinders, sanders, grinding lathe operators.. | 113 | 2 | | 21 | 2 | 25 | | | | | | | | | | |
| Rubber mill operators and helpers..... | 87 | 6 | 10 | 41 | 10 | | 6 | | 50 | 73 | | | | | 2 | 8 |
| Cloth weaving, knitting, spinning machine operator..... | 80 | | 30 | | | | | | | | | | | | | |
| Mandrel and tuber operators, off-bearers.... | 76 | | 39 | 19 | | 39 | | | | | | | | | | |
| Cord and rubber braiders..... | 72 | | | | | | | | | | | | | | | |
| Compound men, weighers..... | 70 | 14 | | 6 | 9 | 23 | | 9 | 40 | 38 | 3 | | | | 1 | 26 |
| Carpenters, woodworkers..... | 63 | | | | | | | | | | | | | | | |
| Banbury mixer operators, mixers..... | 62 | 11 | | 28 | 91 | 11 | 6 | 10 | 27 | 45 | 4 | | | | | 27 |
| Battery top finishers..... | 50 | 80 | | | | | | | | | | | | | | |
| Washer makers..... | 46 | | | 46 | | | | | | | | | | | | |
| Pressers, ironing machine operators..... | 42 | | 349 | 129 | | | | | | | | | | | | |
| Felt makers..... | 38 | | | | | | | | | | | | | | | |
| Rubber cement makers, rubber surfacers.... | 35 | 70 | | 32 | | | | 26 | | | | | | | | |
| Fabric preparers and finishers..... | 33 | 19 | | | | | | | | | | | | | | |
| Yarn carders, cotton and wool pickers..... | 30 | | | | | | | | | | | | | | | |
| Footwear finishers..... | 25 | | 11 | | | | | | | | | | | | | 17 |
| Tumblers..... | 10 | | | 2 | | | | | | | | | | | | |
| Inspectors..... | 9 | 5 | | | | | | 27 | | | | | | | | |
| Assemblers, table production..... | 9 | 15 | | | | | | | | | | | | | | |
| Molders, mold cleaners..... | 8 | 3 | 234 | 18 | 2 | 9 | 70 | 11 | | | | 83 | | 1 | | |
| Vulcanizers, curers..... | | 64 | 145 | 31 | | 39 | 107 | 50 | | | | 22 | | | | |
| Splicers, tube repairers..... | | 51 | | | | | | 15 | | | | | | | | |
| Tire and air bag builders..... | | 20 | 1 | | | 33 | 1 | 33 | | | | | | | | |
| Machinists, millwrights, plumbers..... | | 217 | 6 | 82 | 240 | 39 | | | | | 20 | | | | | 39 |
| Electricians..... | | 14 | | | | | | | | | 12 | | | | | |
| Firemen, coal haulers, stationary engineers.. | | | | 67 | | | 13 | | | | | 13 | | | | 2 |
| Tool and die makers..... | | | | 16 | 16 | | | | | | | | | | | |
| Welders..... | | | | | 35 | | | | | | | 10 | | | | |
| Lacquer and paint men, decorators..... | | | | 18 | | | | 86 | | | | | | | 93 | |
| Solderers..... | | | | | 100 | | | | | | 103 | 103 | | | | |
| Chemists, laboratory workers..... | | | | | | | | | | | | | | 104 | | |
| Miscellaneous..... | 34 | 84 | 64 | 10 | 41 | 31 | 23 | 15 | 2 | 5 | 13 | 18 | 23 | 27 | 8 | 2 |
| | | | | | | | | | | | | | | | | 493 |

¹Rubber Industry includes all plants making hard, soft and sponge products and rubber composition products.

²Rubber dusts, both crude and vulcanized, are classed as organic dusts and make up the majority of exposures in this industry to organic dusts. Other prevalent organic dusts are cloth, felt and wood dusts.

³Next largest material is approximately 1.2% of total number of exposures.

(N. O. S.) Not otherwise specified.

•
PERSONAL
SERVICES
•



Personal Services

Exposures: Only two sub-divisions, laundries and dry cleaning establishments, were surveyed in this group. High humidity was the most frequently reported potential occupational hazard, while dermatitis was second. High humidity was chiefly a factor in the laundries. (See Table 51).

Controls: Indicated controls for specified materials are tabulated in Table 52. It may be seen that 43.5% of the workers exposed to high humidity had one or more controls.

Dry Cleaning Industry; Occupational Analysis: The occupations as well as the relative frequency of material exposures are noted in Table 53.

TABLE 51—PERSONAL SERVICE
LAUNDRIES AND DRY CLEANING

| MATERIAL | NUMBER AND PERCENT OF WORKERS IN EACH SUB GROUP EXPOSED TO SPECIFIED MATERIAL | | | | | |
|------------------------------------|--|---------|-----------|---------|--------------|---------|
| | Total | | Laundries | | Dry cleaning | |
| | Number | Percent | Number | Percent | Number | Percent |
| TOTAL NUMBER WORKERS EMPLOYED..... | 4,930 | ..... | 3,781 | 76.7 | 1,149 | 23.3 |
| High humidity..... | 2,321 | 47.1 | 2,027 | 53.6 | 294 | 25.6 |
| Dermatitis producers..... | 281 | 5.7 | 237 | 6.3 | 44 | 3.8 |
| Organic solvents..... | 232 | 4.7 | 51 | 1.3 | 181 | 15.8 |
| Alkalis..... | 198 | 4.0 | 160 | 4.2 | 38 | 3.3 |
| Carbon monoxide..... | 111 | 2.3 | 94 | 2.5 | 17 | 1.5 |
| Bituminous coal dust..... | 90 | 1.8 | 69 | 1.8 | 21 | 1.8 |
| Halogenated hydrocarbons..... | 83 | 1.7 | 22 | 0.6 | 61 | 5.3 |
| Silicate dusts..... | 82 | 1.7 | 66 | 1.7 | 16 | 1.4 |
| Sulphur dioxide..... | 72 | 1.5 | 58 | 1.5 | 14 | 1.2 |
| Alcohols, esters and ethers..... | 66 | 1.3 | 20 | 0.5 | 46 | 4.0 |
| Organic acids..... | 61 | 1.2 | 10 | 0.3 | 51 | 4.4 |
| Petroleum products..... | 40 | 0.8 | 34 | 0.9 | 6 | 0.5 |
| Gases (N. O. S.)..... | 32 | 0.6 | 9 | 0.2 | 23 | 2.0 |
| Organic dusts..... | 21 | 0.4 | 10 | 0.3 | 11 | 1.0 |
| Benzene..... | 18 | 0.4 | 1 | * | 17 | 1.5 |
| Inks..... | 13 | 0.3 | 10 | 0.3 | 3 | 0.3 |
| Chemicals (N. O. S.)..... | 13 | 0.3 | 2 | * | 11 | 1.0 |
| Dyes..... | 10 | 0.2 | ..... | ..... | 10 | 0.9 |
| Chlorine..... | 10 | 0.2 | 8 | 0.2 | 2 | 0.2 |
| Non-siliceous dusts..... | 9 | 0.2 | 7 | 0.2 | 2 | 0.2 |
| Metals (N. O. S.)..... | 8 | 0.2 | 8 | 0.2 | ..... | ..... |
| Mineral acids..... | 8 | 0.2 | 4 | 0.1 | 4 | 0.3 |
| Aniline..... | 8 | 0.2 | ..... | ..... | 8 | 0.7 |
| Extreme temperature changes..... | 7 | 0.1 | 4 | 0.1 | 3 | 0.3 |
| Sulphur..... | 7 | 0.1 | ..... | ..... | 7 | 0.6 |
| Lacquers..... | 6 | 0.1 | ..... | ..... | 6 | 0.5 |
| Oil (not petroleum)..... | 4 | * | ..... | ..... | 4 | 0.3 |
| Salts..... | 3 | * | 3 | * | ..... | ..... |
| Silica dust..... | 2 | * | ..... | ..... | 2 | 0.2 |
| Paints..... | 2 | * | 2 | * | ..... | ..... |
| Infections..... | 2 | * | 2 | * | ..... | ..... |
| Lead..... | 1 | * | 1 | * | ..... | ..... |

*Less than 0.1%
(N. O. S.) Not otherwise specified.

TABLE 52—PERSONAL SERVICE—LAUNDRIES AND DRY CLEANING—CONTROLS
162 Plants—4,930 Employees

| MATERIAL | Number of workers exposed | PERCENT OF EXPOSED WORKERS HAVING INDICATED TYPE OF CONTROL | | | | | | | | | | Percent of exposed workers having one or more controls | |
|----------------------------------|---------------------------|---|----------|---------------|------------------|------------|----------|---------------|--------------|---------------------|---------------------|--|-------|
| | | General ventilation | | Local exhaust | Enclosed process | Wet method | Gas mask | Respirator | | Air line respirator | Protective clothing | | Other |
| | | Positive | Negative | | | | | Approved type | Not approved | | | | |
| High humidity..... | 2,321 | 7.2 | 37.0 | 6.1 | * | | | | | | | | 43.5 |
| Dermatitis producers..... | 281 | | | | | | | | | | | | |
| Organic solvents..... | 232 | 0.9 | 31.0 | 23.7 | 20.7 | | | | | | | | 56.5 |
| Alkalis..... | 198 | | 18.7 | 5.6 | | | | | | | | | 22.2 |
| Carbon monoxide..... | 111 | | 2.7 | | 1.8 | | | | | | | | 4.5 |
| Bituminous coal dust..... | 90 | | 5.6 | | | | | | | | | | 5.6 |
| Halogenated hydrocarbons..... | 83 | | 22.9 | 12.0 | 10.8 | | | | | | | | 33.7 |
| Silicate dusts..... | 82 | | 6.1 | | | | | | | | | | 6.1 |
| Sulphur dioxide..... | 72 | | 2.8 | | 2.8 | | | | | | | | 5.6 |
| Alcohols, esters and ethers..... | 66 | | 25.8 | 18.2 | 10.6 | | | | | | | | 43.9 |
| Organic acids..... | 61 | | 26.2 | 4.9 | | | | | | | | | 27.9 |
| Petroleum products..... | 40 | | 5.0 | 5.0 | | | | | | | | | 5.0 |
| Gases (N. O. S.)..... | 32 | | 15.6 | 12.5 | 3.1 | | | | | | | | 18.8 |
| Organic dusts..... | 21 | 0.9 | 31.0 | 23.7 | 20.7 | | | | | | | | 56.5 |
| Benzene..... | 18 | | 11.1 | 5.6 | 5.6 | | | | | | | | 22.2 |
| Inks..... | 13 | | | | | | | | | | | | |
| Chemicals (N. O. S.)..... | 13 | | 23.1 | | | | | | | | | | 23.1 |
| Dyes..... | 10 | | | | | | | | | | | | |
| Chlorine..... | 10 | | 40.0 | | | | | | | | | | 40.0 |
| Non-siliceous dusts..... | 9 | | 22.2 | | | | | | | | | | 22.2 |
| Metals (N. O. S.)..... | 8 | | | | | | | | | | | | |
| Mineral acids..... | 8 | | 37.5 | 12.5 | | | | | | | | | 37.5 |
| Aniline..... | 8 | | | | | | | | | | | | |
| Extreme temperature changes..... | 7 | | 28.6 | 42.9 | 28.6 | | | | | | | | |
| Sulphur..... | 7 | | 71.4 | | | | | | | | | | 71.4 |
| Isocyanates..... | 6 | | 25.0 | | | | | | | | | | 25.0 |
| Oil (not petroleum)..... | 4 | | | | | | | | | | | | |
| Salts (N. O. S.)..... | 3 | | | | | | | | | | | | |
| Silica dust..... | 2 | | | 100.0 | | | | | | | | | 100.0 |
| Paints..... | 2 | | | | | | | | | | | | |
| Infections..... | 2 | | | | | | | | | | | | |
| Lead..... | 1 | | | | | | | | | | | | |

*Less than 0.1%
(N. O. S.) Not otherwise specified.

TABLE 53—DRY CLEANING INDUSTRY:
MATERIAL EXPOSURE BY OCCUPATION

Survey Data: 61 Plants; 1,149 Employees; 547 Employees were given 902 Exposures

| OCCUPATION | NUMBER OF WORKERS EXPOSED TO SPECIFIED MATERIALS BY OCCUPATION | | | | | | | | | | | | | |
|-----------------------------------|---|------------------|--------------------------|---------------|-----------------------------|----------------------|---------|------------------|-----------------------|---------|-----------------|----------------|-----------------|--------------------------|
| | High humidity | Organic solvents | Halogenated hydrocarbons | Organic acids | Alcohols, esters and ethers | Dermatitis producers | Alkalis | Gases (N. O. S.) | Bituminous coal dust. | Benzene | Carbon monoxide | Silicate dusts | Sulphur dioxide | Miscellaneous* materials |
| TOTAL NUMBER WORKERS EXPOSED..... | 294 | 181 | 61 | 51 | 46 | 44 | 38 | 23 | 21 | 17 | 17 | 16 | 14 | 79 |
| Steam pressers..... | 161 | | | | | | | | | | | | | |
| Hand ironers..... | 66 | | | | | | | | | | | | | |
| Dry cleaners..... | 22 | 91 | 10 | 7 | 16 | | 24 | 5 | 5 | 5 | 3 | 2 | 3 | |
| Finishers, finishing ironers..... | 16 | | | | | | | | | | | | | |
| Washers, wet cleaners..... | 10 | 2 | | 3 | | 13 | 4 | | 1 | | | | | |
| Repairers..... | 5 | | | | | | | | | | | | | |
| Hat cleaners, blockers..... | 5 | 9 | 2 | | | | | | | | | | | |
| Rug cleaners and dyers..... | 3 | 2 | | | | 12 | 8 | | | | | | | |
| Spotters..... | 3 | 70 | 46 | 39 | 29 | | 2 | 14 | | 12 | | | | |
| Dyers..... | 3 | | | | | | | | | | | | | |
| Superintendents, managers..... | | 3 | 2 | 2 | 1 | | | 1 | | | | | | |
| Boiler firemen..... | | | | | | | | 3 | 15 | | 14 | 14 | 11 | |
| Shine boys..... | | | | | | 19 | | | | | | | | |
| Miscellaneous..... | | 4 | 1 | | | | | | | | | | | 79 |

*Includes dry cleaning, dyeing and pressing shops, but not laundries except where laundering is done incidentally.

*Next largest material is less than 1.0% of the total number of exposures.

•

SURVEY
SUMMARY
TABLES

•

Summary Tables

Table 54 is a summary of previous tables showing the materials in each service group to which 10% or more of the persons in that industry are exposed.

Table 55 shows the number of persons, in the sample studied exposed to the important materials, irrespective of the industry in which it occurred. The table lists "important" materials not from a numerical standpoint, but from the possible injury that it may produce. For example the study as a whole showed numerically that metals (N. O. S.) had the greatest frequency and that lead was 11th in numerical order. However, from the standpoint of potential pathology lead would overshadow metals (N. O. S.) since most of the metals classified under this were iron and steel.

It is believed that our sample for each group was adequate and consequently that our percentage could be applied to our industrial population for each group, so that we may estimate a total "expected" number of Indiana workers potentially exposed to the various materials. This, however, requires an accurate knowledge of the total number of workers employed in each industry for the present time. In the absence of such data, and with the knowledge that such figures, if accurate at the time of collection, are subject to change, the estimate of the total number of workers exposed to each material was based on the 1930 census, corrected according to industrial classification used in this study. These data are shown in Table 56.

The choice of the 1930 population census instead of a more recent biennial census was due to the greater accuracy of the decennial census, and to the belief that the 1930 census figure most closely approached the actual employment at the time of the survey.

Table 56 shows the number of persons, in the industries studied, who are expected to have potential exposures to the materials classified in this study. The estimates are based on the total working population in those industries surveyed. Since some of the industries omitted would contribute some additional exposures, it is probable that the expected number of potential exposures for all gainful workers in Indiana will be slightly higher than the values shown.

Thus it would appear that for Indiana one would expect to find 42,540 exposed to dermatitis producers, 11,566 to silica dust, 11,886 to lead, 1,059 to cyanides and etc.

These data reveal that a large portion of Indiana's industrial population potentially comes in contact with numerous hazardous materials. Further it is important to remember that the material contributing the greatest number of exposures may not be the most toxic material. Nevertheless, these data properly interpreted are very useful in planning preventive programs in the future. Basically that was the objective of this huge "physical examination" of this large "industrial patient" of ours. We have our findings on physical examination, certain laboratory studies now seem indicated so that we can reach a true diagnosis. Once a diagnosis is made the treatment will be apparent.

TABLE 54—MATERIALS IN EACH INDUSTRY OR SERVICE GROUP TO WHICH 10% OR MORE PERSONS WERE EXPOSED

| INDUSTRY OR SERVICE GROUP | MATERIAL | EXPOSED PERSONS | |
|---------------------------------------|----------------------------------|-----------------|--------|
| | | Percent | Number |
| Extraction minerals..... | Bituminous coal dust..... | 70.6 | 3,320 |
| | Silica dust..... | 16.2 | 761 |
| Chemical and allied..... | | | |
| Cigar and tobacco..... | Dermatitis producers..... | 36.6 | 379 |
| | Organic dusts..... | 18.4 | 190 |
| Clay, glass and stone..... | Non-siliceous dusts..... | 18.6 | 2,859 |
| | Silicate dusts..... | 15.0 | 2,308 |
| | Extreme temperature changes..... | 12.7 | 1,942 |
| | Silica dust..... | 10.9 | 1,675 |
| Clothing and allied..... | Organic dusts..... | 14.6 | 2,548 |
| Food and allied..... | Dermatitis producers..... | 32.7 | 11,601 |
| | High humidity..... | 17.2 | 6,102 |
| Iron and steel..... | Metals (N. O. S.)..... | 33.3 | 26,886 |
| | Dermatitis producers..... | 10.3 | 8,354 |
| Metals other than iron and steel..... | Metals (N. O. S.)..... | 31.2 | 2,959 |
| Leather..... | Dermatitis producers..... | 16.4 | 338 |
| | Organic dusts..... | 10.5 | 215 |
| Lumber and furniture..... | Organic dusts..... | 34.4 | 6,448 |
| Paper, printing and allied..... | Lead..... | 15.2 | 1,841 |
| | Inks..... | 13.3 | 1,604 |
| | Organic solvents..... | 12.7 | 1,529 |
| | Antimony..... | 11.0 | 1,330 |
| Textile..... | Organic dusts..... | 45.6 | 3,751 |
| | High humidity..... | 33.2 | 2,734 |
| Miscellaneous manufacturing..... | Metals (N. O. S.)..... | 13.0 | 2,836 |
| | Organic dusts..... | 10.0 | 2,182 |
| | Dermatitis producers..... | 9.6 | 2,088 |
| Personal services..... | High humidity..... | 47.1 | 2,321 |

TABLE 55—NUMBER OF PERSONS IN THE SAMPLE STUDIED EXPOSED TO SOME OF THE IMPORTANT MATERIALS

| MATERIAL | Number of employees exposed |
|----------------------------------|-----------------------------|
| Inorganic non-metallic dusts: | |
| Silica dust..... | 11,842 |
| Silicate dusts..... | 11,312 |
| Non-siliceous dusts..... | 9,647 |
| Bituminous coal dust..... | 6,800 |
| Asbestos dust..... | 315 |
| Metallic dusts and fumes: | |
| Lead..... | 6,884 |
| Antimony..... | 1,506 |
| Chromium..... | 411 |
| Mercury..... | 154 |
| Cadmium..... | 132 |
| Arsenic..... | 122 |
| Manganese..... | 77 |
| Selenium..... | 29 |
| Phosphorus..... | 2 |
| Organic dusts..... | 22,948 |
| Gases: | |
| Carbon monoxide..... | 6,364 |
| Sulphur dioxide..... | 2,115 |
| Chlorine..... | 77 |
| Hydrogen sulphide..... | 26 |
| Miscellaneous materials: | |
| Dermatitis producers..... | 27,599 |
| High humidity..... | 15,623 |
| Extreme temperature changes..... | 12,921 |
| Petroleum products..... | 10,067 |
| Organic solvents..... | 5,128 |
| Mineral acids..... | 2,381 |
| Infections..... | 1,248 |
| Dyes..... | 971 |
| Coal tar products..... | 638 |
| Cyanides..... | 579 |
| Halogenated hydrocarbons..... | 452 |
| Aniline..... | 136 |

TABLE 56.—EXPECTED NUMBER OF PERSONS IN INDIANA EXPOSED TO DATA OBTAINED IN THE SURVEY

| MATERIAL | Total for all industries | Extraction of minerals | Chemical and allied | Cigar and tobacco | Clay, glass and stone | Clothing and allied | Food* and allied | Iron and steel | Metals* other than iron and steel | Leather | Furniture and lumber | Paper and allied | Textiles | Miscellaneous manufacturing | Personal Services |
|------------------------------------|--------------------------|------------------------|---------------------|-------------------|-----------------------|---------------------|------------------|----------------|-----------------------------------|---------|----------------------|------------------|----------|-----------------------------|-------------------|
| TO ALL EMPLOYEES—1930 U. S. CENSUS | 404,059 | 24,034 | 17,704 | 2,997 | 22,449 | 18,391 | 25,901 | 161,305 | 7,146 | 5,261 | 30,662 | 16,822 | 8,694 | 52,445 | 9,748 |
| Metals (N. O. S.) | 69,173 | 841 | 1,332 | 12 | 1,806 | 63 | 389 | 53,700 | 2,959 | 18 | 608 | 555 | 46 | 6,818 | 16 |
| Dermatitis producers | 42,540 | 659 | 1,027 | 1,097 | 768 | 107 | 11,601 | 16,700 | 366 | 863 | 2,400 | 1,020 | 348 | 5,030 | 554 |
| Organic dusts | 34,930 | 138 | 950 | 550 | 521 | 2,760 | 2,164 | 6,050 | 454 | 549 | 10,540 | 1,009 | 3,964 | 5,240 | 41 |
| High humidity | 21,287 | 82 | 488 | 96 | 326 | 1,170 | 6,102 | 1,720 | 94 | 324 | 337 | 355 | 2,886 | 2,727 | 4,580 |
| Extreme temperature changes | 9,522 | 216 | 1,550 | | 2,881 | 12 | 1,831 | 1,350 | 381 | 21 | 87 | 50 | 5 | 1,154 | 14 |
| Silica dust | 11,566 | 147 | 2,460 | | 4 | 10 | 1,395 | 458 | 51 | 1 | 2,510 | 17 | | 625 | |
| Slake dusts | 20,200 | 736 | 3,390 | 9 | 2,460 | 118 | 688 | 9,420 | 413 | 51 | 840 | 233 | 45 | 3,210 | 162 |
| Gases (N. O. S.) | 18,887 | 991 | 928 | | 3,390 | 25 | 1,550 | 9,820 | 547 | 100 | 260 | 372 | 26 | 2,235 | 63 |
| Petroleum products | 17,622 | 913 | 1,014 | 63 | 1,970 | 151 | 870 | 10,030 | 547 | 59 | 460 | 454 | 552 | 1,560 | 79 |
| Non-siliceous dusts | 17,689 | 1,210 | 241 | 12 | 4,186 | 22 | 161 | 7,830 | 716 | 92 | 507 | 93 | 31 | 2,570 | 18 |
| Lead | 11,886 | 20 | 413 | | 188 | 8 | 112 | 3,590 | 840 | 21 | 258 | 2 | 2,565 | 3,850 | 2 |
| Bituminous coal dust | 22,478 | 16,968 | 226 | 9 | 949 | 64 | 686 | 2,240 | 82 | 38 | 435 | 42 | 42 | 437 | 178 |
| Carbon monoxide | 21,278 | 432 | 432 | 9 | 700 | 72 | 1,028 | 6,330 | 233 | 43 | 417 | 152 | 51 | 708 | 219 |
| Organic solvents | 8,093 | 788 | 391 | | 391 | 52 | 188 | 1,750 | 215 | 66 | 880 | 2,130 | 45 | 1,130 | 458 |
| Alkalies | 4,689 | 576 | 254 | | 229 | 2 | 1,033 | 1,060 | 206 | 49 | 46 | 88 | 43 | 910 | 390 |
| Paints | 4,543 | 10 | 395 | | 19 | 10 | 66 | 2,290 | 412 | 5 | 552 | 74 | 7 | 497 | 4 |
| Mineral acids | 4,122 | 354 | 354 | | 25 | | 118 | 1,900 | 325 | 13 | 75 | 116 | 26 | 1,060 | 16 |
| Oils (not petroleum) | 3,721 | 251 | 251 | | 32 | 31 | 303 | 2,290 | 146 | 128 | 81 | 81 | 12 | 242 | 8 |
| Sulphur dioxide | 3,011 | 120 | 145 | 9 | 362 | 45 | 137 | 1,500 | 11 | 95 | 60 | 237 | 28 | 84 | 26 |
| Inks | 3,578 | 352 | 75 | | 19 | | 483 | 1,030 | 49 | 38 | 332 | 92 | 31 | 468 | 142 |
| Lacquers | 3,227 | 195 | 145 | | 362 | | 11 | 1,130 | 139 | 3 | 1,128 | 47 | 13 | 650 | 12 |
| Antimony | 2,114 | 19 | 75 | | 4 | 1 | 10 | 534 | 64 | 18 | 31 | 1,855 | 1 | 41 | 26 |
| Chemicals (N. O. S.) | 2,180 | 10 | 655 | | 139 | 3 | 180 | 57 | 57 | 77 | 5 | 162 | 17 | 374 | 4 |
| Infections | 1,567 | 5 | 227 | | | 17 | 795 | | 4 | 230 | 576 | 127 | 27 | 408 | 4 |
| Dyes | 1,548 | | 36 | | 31 | 24 | 17 | 54 | | | | 243 | 243 | 190 | 20 |
| Alcohols, esters and ethers | 1,260 | 235 | 15 | | 15 | 11 | 224 | 194 | 100 | 4 | 8 | 64 | 2 | 192 | 130 |
| Salts (N. O. S.) | 906 | 238 | 84 | | 84 | 3 | 161 | 286 | 84 | 31 | 11 | 26 | 13 | 46 | 6 |
| Coal tar products | 1,020 | 165 | 138 | | 138 | | 53 | 138 | 70 | 3 | 3 | 15 | | 413 | |
| Sulphur and compounds | 1,038 | 140 | 218 | | 218 | | 1 | 56 | 3 | | | 6 | | 530 | 14 |
| Cyanides | 1,059 | | | | | | | 560 | 132 | | 31 | 20 | | 310 | |
| Halogenated hydrocarbons | 819 | 92 | 12 | | 12 | 4 | 4 | 240 | 28 | | 8 | 8 | 12 | 255 | 164 |
| Chromium | 753 | 9 | | | 16 | | 29 | 378 | 93 | 5 | 20 | 13 | 5 | 235 | |
| Medicinals | 438 | 181 | 82 | 3 | 233 | 2 | 20 | 150 | 7 | 3 | 5 | | | 36 | |
| Asbestos dust | 469 | 82 | 45 | | 7 | 6 | 54 | 140 | 11 | 36 | | 67 | 2 | 84 | 120 |
| Organic acids | 477 | 477 | 57 | | 57 | 1 | 93 | 118 | 6 | | 8 | 18 | | 26 | 36 |
| Aldehyde | 318 | 11 | 20 | | 25 | | | 30 | 12 | | 38 | 71 | | 408 | |
| Benzene | 308 | 20 | 15 | | 15 | | | 24 | 20 | | 3 | | | 14 | |
| Accelerators | 468 | | | | | | | 8 | 1 | | 7 | 28 | 30 | 70 | 16 |
| Mercury | 235 | 11 | | | 97 | 8 | | 2 | 39 | 100 | | | | 110 | |
| Aniline | 248 | 9 | | | | | | 2 | | 69 | | | | 5 | |
| Cadmium | 239 | | | | 6 | | | 76 | | | | | | 5 | |
| Arsenic | 165 | 37 | 113 | | 113 | | | | 10 | | | | | 5 | |
| Fluorides | 133 | 16 | 65 | | 65 | | | | 47 | | | | | 5 | |
| Manganese | 149 | 2 | 1 | | 1 | | | 138 | 3 | | | | | 5 | |
| Chlorine | 90 | 6 | | | | | 49 | | | | | | | 5 | |
| Selenium | 43 | | 43 | | | 10 | | | | | 2 | | 3 | | 20 |
| Hydrogen sulphide | 32 | | | | | | | | | | | | | | |
| Anthracite coal dust | 16 | | | | 13 | | | | | | 7 | | | | |
| Amines | 7 | | | | | | | | | | 3 | | | | |
| Phosphorus | 2 | | | | | | | | | | | | | | |
| Radium | | | | | | | | | | | | | | | |

*As the number of workers surveyed in the Food and Allied industry and the Metals Other than Iron and Steel industry was greater than the U. S. Census figure, the expected number of persons exposed is given as 100% of that obtained in the survey.

Acknowledgments

For policies and letters to manufacturers, prior to the survey, the Bureau is indebted to Dr. V. K. Harvey, Director, Indiana State Board of Health.

The industrial file was completed largely through the cooperation of the Indiana Unemployment Compensation Division and the State Planning Board. The data on milk plants and canning industry was supplied by the State Board of Health, Bureau of Dairy Products and Bureau of Food and Drugs, respectively. The Indiana Canners' Association also supplied us with a list of canning plants.

The field work was carried out by our own personnel with the valuable and immeasurable service of the United States Public Health Service, Division of Industrial Hygiene, by training our field staff, organizing the office and assisting in the conduct of the survey. Sanitary Engineer J. J. Bloomfield assisted in the training of the field staff, Mrs. Mary F. Peyton helped organize the survey and Mr. Richard T. Page assisted in the summary and writing of this report.

Other agencies that cooperated are the State Labor Department, Mr. Thomas Hutson, Director; Bureau of Sanitary Engineering, State Board of Health, Mr. B. A. Poole, Chief; state and city Chambers of Commerce, State Mining Board, and officials of all the establishments covered in the study. The officials cooperated whole-heartedly in furnishing the information requested. This is deeply appreciated by the Bureau since the survey was voluntary on the part of plant officials.

All illustrations are by Bird Baldwin, Staff Artist, of the Indiana State Board of Health.



APPENDIX

1. A—Forms
2. B—Industrial Codes
3. C—References



APPENDIX A

Form 3

INDIANA INDUSTRIAL HYGIENE SURVEY
INDUSTRIAL HEALTH SERVICE DATA

Page.....of.....
Surveyed by.....

Name of Plant.....Date.....
County.....City.....Industry Code and No.....
Plant Owner.....Address.....Location.....

Product Manufactured or Service.....
Plant official.....Title.....

NO. EMPLOYEES
M.....
F.....
T.....

| SAFETY PROVISIONS | | | MEDICAL PROVISIONS | | BENEFITS AND RECORDS | | SANITARY | |
|---|----------------|---------------------------|--------------------|-------------------|----------------------------|---------------------|----------------|--|
| Safety Director: | Full Time..... | Company..... | Physician: | Full Time..... | Sick Benefit Organization: | Yes..... No..... | Public Supply | |
| | Part Time..... | Contract..... | | Part Time..... | | | Fountain No. | |
| | None..... | None..... | | On Call..... | | | Individual Cup | |
| | | | | None..... | | | Common Cup | |
| Shop Committee: | Yes..... | Yes..... | Nurse: | Full Time..... | Sickness Record: | Yes..... No..... | Other | |
| | No..... | No..... | | Part Time..... | | | Other | |
| | | | | None..... | Waiting Period: | No. Days..... | Cold Water | |
| | | | P. H..... | | | | Hot Water | |
| Insurance Service: | Yes..... | Yes..... | | R. N..... | Accident | Yes..... No..... | Soap | |
| | No..... | No..... | | Other..... | | | Common Towel | |
| Other: | Yes..... | Yes..... | Remarks: | | | | Other Towel | |
| | No..... | No..... | | | | | Shower | |
| Remarks: | | Trained First Aid Worker: | Remarks: | | | | Flush M F | |
| | | | | Pit Privy M F | | | | |
| | | | | Urinal No. | | | | |
| | | | | Other No. | | | | |
| | | | | Sep. Lunch Room | | | | |
| | | | | Individual Locker | | | | |
| Maximum Employees | | | | | | | | |
| INDIANA STATE BOARD OF HEALTH, BUREAU OF INDUSTRIAL HYGIENE | | | | | M | F | T | |

[illegible]

Form 9.

INDIANA INDUSTRIAL HYGIENE SURVEY
CONTROL MEASURES FOR SPECIFIED EXPOSURE IN EACH INDUSTRY

Material Exposure..... Page.....
Industry Code..... Name of Industry.....

| | | NUMBER OF PERSONS TO WHOM CONTROL IS AVAILABLE CLASSIFIED BY PLANTS | | | | | | | | | | | | | | | | Total All Plants | |
|------------------------------|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------------------|---|
| | | | | | | | | | | | | | | | | | | | |
| Plant Number | | | | | | | | | | | | | | | | | | | |
| Number of Employees Exposed | * | | | | | | | | | | | | | | | | | | |
| TYPE OF CONTROL | | | | | | | | | | | | | | | | | | | |
| Positive General Ventilation | | | | | | | | | | | | | | | | | | | |
| Negative General Ventilation | | | | | | | | | | | | | | | | | | | |
| Local Exhaust | | | | | | | | | | | | | | | | | | | |
| Enclosure | | | | | | | | | | | | | | | | | | | |
| Wet Methods | | | | | | | | | | | | | | | | | | | |
| Gas Masks | | | | | | | | | | | | | | | | | | | |
| Respirator | | | | | | | | | | | | | | | | | | | |
| Air Line Respirator | | | | | | | | | | | | | | | | | | | |
| Protective Clothing | | | | | | | | | | | | | | | | | | | |
| Other | | | | | | | | | | | | | | | | | | | |
| Total Persons | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | % |

*Number of employees brought forward. INDIANA STATE BOARD OF HEALTH, BUREAU OF INDUSTRIAL HYGIENE

DAILY PROGRESS CHART—INDIANA INDUSTRIAL HYGIENE SURVEY

WEEK OF JULY 17, 1938

| FIELD ENGINEER | Monday 18 | | | | Tuesday 19 | | | | Wednesday 20 | | | | Thursday 21 | | | | Friday 22 | | | | Saturday 23 | | | | Total | | | | |
|----------------|-----------|--------|---------|-----------|------------|--------|---------|-----------|--------------|--------|---------|-----------|-------------|--------|---------|-----------|-----------|--------|---------|-----------|-------------|--------|---------|-----------|-------|--------|----------|-----------|-----|
| | Moved | Closed | Refused | Completed | Moved | Closed | Refused | Completed | Moved | Closed | Refused | Completed | Moved | Closed | Refused | Completed | Moved | Closed | Refused | Completed | Moved | Closed | Refused | Completed | Moved | Closed | Refused | Completed | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 5 | 0 | 1 | 0 | 9 | 13 | Assigned | | |
| Fleming | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 6 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 8 | 19 | | |
| Goory | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 10 | 19 | | | |
| Hollenbeck | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 4 | 1 | 0 | 0 | 2 | 1 | 0 | 0 | 18 | 24 | | | |
| Karnisky | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 5 | 15 | | | |
| Keppler | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 6 | 15 | | | |
| Miller | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 2 | 0 | 3 | 0 | 1 | 0 | 3 | 0 | 10 | 20 | | | |
| Reichelderfer | 0 | 0 | 0* | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 4 | 0 | 3 | 0 | 1 | 0 | 3 | 0 | 11 | 23 | | | |
| Schellhase | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 0 | 6 | 12 | | | | |
| Timm | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 10 | 19 | | | |
| TOTAL | 1 | 1 | 0 | 12 | 0 | 1 | 0 | 10 | 3 | 1 | 0 | 9 | 0 | 0 | 0 | 23 | 0 | 1 | 0 | 22 | 1 | 9 | 0 | 17 | 5 | 13 | 0 | 93 | 179 |

APPENDIX B

TABLE 57—INDIANA STATE BOARD OF HEALTH, BUREAU INDUSTRIAL HYGIENE
INDUSTRIAL CODES

Extraction of Minerals

| | | | |
|-----|-------------|-----|-----------------|
| V2 | Coal Mines | V9A | Sand and Gravel |
| V2A | Strip Mines | V9B | Limestone |
| V9 | Quarries | | |

Manufacturing and Mechanical Industries

CHEMICAL AND ALLIED;

| | | | |
|-----|--|-----|------------------------|
| X3 | Explosives, Ammunition and Fireworks Factories | OVE | Compressed Gases |
| X4 | Fertilizer Factories | OVG | Drugs, Patent Medicine |
| X5 | Gas Works | OVH | Glues, Paste |
| X6 | Paint and Varnish Factories | OVI | Greases, Tallow |
| X7 | Petroleum Refineries | OVI | Oils, Not Petroleum |
| X9 | Soap Factories | OVK | Perfumes, Cosmetics |
| OV8 | Blackening, Stains, Etc. | OVL | Other Chemicals |
| OVD | Chemicals | | |

CIGAR AND TOBACCO FACTORIES

| | |
|----|-------------------|
| OO | Cigar and Tobacco |
|----|-------------------|

CLAY, GLASS AND STONE INDUSTRIES

| | | | |
|-----|---------------------------|-----|--|
| O1 | Brick, Tile, Terra Cotta | O4 | Marble and Stone Yards |
| O2 | Glass Factories | O5 | Potteries |
| O2A | Mirrors | 2VA | Roofing—Asphalt |
| O3A | Cement | 2VB | Asbestos Products |
| O3C | Lime and Artificial Stone | 2VD | Rockwool and Other Clay, Glass and Stone |

CLOTHING INDUSTRIES

| | | | |
|----|------------------------|-----|------------------|
| O7 | Glove Factories | 10A | Women's Clothing |
| O9 | Shirt, Collar and Cuff | 10C | Other Clothing |
| IV | Suit, Coat and Overall | | |

FOOD AND ALLIED INDUSTRIES

| | | | |
|----|-----------------------------------|-----|---------------------------------------|
| 11 | Bakeries | 19A | Ice Manufacturing |
| 12 | Butter, Cheese and Milk | 19B | Spices, Coffee |
| 13 | Candy Factories | 19C | Other |
| 15 | Flour and Grain Mills | 20A | Liquor and Beverage Industries (Soft) |
| 16 | Fruit and Vegetable Canning, Etc. | 20B | Alcoholic Beverages |
| 17 | Slaughter and Packing Houses | | |

IRON AND STEEL INDUSTRIES, MACHINERY AND VEHICLE INDUSTRIES

| | | | |
|-----|--|-----|---|
| 21 | Agricultural Implement Factories | 28A | Aircraft |
| 22 | Automobiles | 28B | Foundries |
| 24B | Blast Furnaces and Steel Rolling Mills (Except Wire) | 28C | Machine Shops |
| 24A | Wire Mills | 28D | Small Machinery, Implements and Cutlery |
| 25 | Car and Railroad Shops | 28E | Heavy Machinery |
| 26 | Ship and Boat Building | 28F | Other |
| 27 | Wagon and Carriage | | |

METAL INDUSTRIES, EXCEPT IRON AND STEEL

| | | | |
|----|----------------------------------|-----|----------------------------------|
| 3V | Brass Mills, Musical Instruments | 36A | Aluminum |
| 31 | Copper Factories | 36B | Metal Specialties, Novelties |
| 33 | Jewelry Factories | 36C | Other |
| 34 | Lead and Zinc Factories | 36D | Electro Plating, Metal Finishing |
| 35 | Tinware, Enamelware, Etc. | | |

LEATHER INDUSTRIES

| | | | |
|----|-----------------------------------|----|-------------------------|
| 38 | Leather Belt, Leather Goods, Etc. | 40 | Tanneries |
| 39 | Shoe Factories | 41 | Trunk, Suitcase and Bag |

LUMBER AND FURNITURE INDUSTRY

| | | | |
|-----|---------------------|----|-----------------------|
| 42A | Furniture Factories | 44 | Saw and Planing Mills |
| 42B | Caskets | 45 | Other Woodworking |
| 43 | Piano and Organ | | |

PAPER, PRINTING AND ALLIED INDUSTRY

| | | | |
|-----|---------------------------|-----|---------------------------|
| 46A | Paper Products (N. O. S.) | 49B | Engraving and Developing |
| 46B | Wax and Wall Paper | 49C | Lithographing |
| 47 | Paper and Pulp Mills | 49D | Newspaper |
| 48 | Paper Box Factories | 49E | Stereotype |
| 49A | Book Binding | 49F | Other Printing and Allied |

TEXTILE INDUSTRIES

| | | | |
|----|--|----|----------------------------|
| 50 | Knitting Mills | 55 | Hemp, Jute and Linen Mills |
| 52 | Textile Dyeing, Finishing and Printing Mills | 58 | Sail, Awning and Tent |
| 53 | Woolen and Worsted Mills | 59 | Other Textile Mills |

MISCELLANEOUS MANUFACTURING INDUSTRIES

| | | | |
|-----|-------------------------------------|-----|--|
| 60 | Broom and Brush | 68A | Dental Appliances and Supplies |
| 61 | Button Factories | 68C | Signs |
| 63A | Batteries | 68D | Toys and Novelties |
| 63B | Lamps | 68E | Hair Goods, Artificial Flowers |
| 63C | Other Electric Machine and Supplies | 68F | Lenses |
| 65 | Rubber Factories | 68G | Lamp and Window Shades |
| 66 | Straw and Strawboard Factories | 68H | Other Miscellaneous Manufacturing Industries |

Personal Service

| | | | |
|----|-----------|----|--------------|
| 97 | Laundries | 98 | Dry Cleaning |
|----|-----------|----|--------------|

TABLE 58—MAJOR EXPOSURE CLASSIFICATIONS

| | |
|-----------------------------|--|
| Accelerators | Extreme Temperature Changes |
| Alcohols, Esters and Ethers | Fluorides |
| Aldehydes | Gases (N. O. S.) |
| Alkalis | Halogenated Hydrocarbons |
| Amines | High Humidity |
| Aniline and its Compounds | Hydrogen Sulphide |
| Antimony and its Compounds | Infections |
| Arsenic and its Compounds | Inks |
| Benzene | Lacquers and Varnishes |
| Cadmium and its Compounds | Lead |
| Carbon Monoxide | Manganese |
| Chemicals (N. O. S.) | Medicinals (N. O. S.) |
| Chlorine | Mercury and its Compounds |
| Chromium and its Compounds | Metals (N. O. S.) |
| Coal Tar Products | Mineral Acids |
| Cyanides | Oils, Fats and Waxes (Not Petroleum) |
| Dermatitis Producers | Organic Acids |
| Anthracite Coal Dust | Organic Solvents |
| Asbestos Dusts | Paints and Enamels |
| Bituminous Coal Dust | Petroleum Products (Other than Solvents) |
| Non-Siliceous Dusts | Phosphorus |
| Organic Dusts | Salts Inorganic (N. O. S.) |
| Silica Dusts | Selenium and its Compounds |
| Silicate Dusts | Sulphur and its Compounds |
| Dyes | Sulphur Dioxide |

TABLE 59—EXAMPLES OF PRODUCTS INCLUDED UNDER EACH MAJOR CLASSIFICATION

| | |
|---|---------------------------|
| Accelerators— | Coal Tar Products— |
| Ammonia Formaldehyde | Coal Tar |
| Butraldehyde Aniline | Coal Tar Paint |
| Butyl Aldehyde | Creosote |
| Butylamine | Cumar Resin |
| Butylamine Aniline | Hydroquinone. |
| Diorthotolylguanidine | Napthalene |
| Diphenylguanidine | Nitrobenzene |
| Mercaptobenzothiozole | Phenol |
| Paraphenylenediamine | Phenolic Resins |
| Piperidine | Pyridine |
| Tetramethylthiuram disulphide | Cyanides— |
| Tetramethylthiuramonasulphide | Cyanogen |
| Thiocarbamites | Hydrocyanic Acid |
| Toluidine | Potassium Cyanide |
| Xexamethylinetetramine | Sodium Cyanide |
| Alcohols, Esters and Ethers— | Zinc Cyanide |
| Ethyl and Methyl Alcohols | Dermatitis Producers— |
| Amyl Acetate | Animal Products |
| Butyl Acetate | Chocolate |
| Ethyl Acetate | Cutting Oils |
| Esters | Dough |
| Aldehydes— | Sugar |
| Acrolein | Tobacco |
| Formaldehyde | Vanilla |
| Alkalis— | Vegetable Products |
| Ammonium Hydroxide | Anthracite Coal Dust |
| Barium Hydroxide | Asbestos Dusts |
| Barium Oxide | Bituminous Coal Dust |
| Calcium Hydroxide | Non-Siliceous Dusts— |
| Calcium Oxide | Alundum |
| Cleaning Compounds | Barium Sulphate |
| Magnesium Oxide | Bone Meal |
| Oakite | Calcium Carbonate |
| Potash | Corundum |
| Potassium Carbonate | Emery |
| Potassium Hydroxide | Limestone |
| Sal Soda | Marble |
| Soda Ash | Maynesite |
| Sodium Carbonate | Rockwool |
| Sodium Hydroxide | Plaster of Paris (Gypsum) |
| Sodium Salicylate | Tricalcium Phosphate |
| Sodium Hypochlorite (dry) | Organic Dusts— |
| Washing Powders | Cotton |
| Wyandotte Cleaner | Coke |
| Animes— | Carbon Black |
| Alifatic Amines | Dextrin |
| Aniline and its Compounds— | Feathers |
| Acetanilide | Felt |
| Dimethylaniline | Fibre |
| Paranitro aniline | Fur |
| Antimony and its Compounds— | Graphite |
| Type Metal | Gums and Resin |
| Arsenic and its Compounds | Kapock |
| Benzene | Leather |
| Cadmium and its Compounds | Mustard Seed |
| Carbon Monoxide | Paper |
| Chemicals (N. O. S.)— | Rags |
| Organic and Inorganic where they were not specified | Rayon |
| Chlorine | Rosin |
| Chromium and its Compounds— | Sawdust |
| Chrome Ore | Sisal (Hemp) |
| Chromic Acid | Spices |
| Chrome Alum | Straw |
| Potassium Dichromate | Starch |
| Other Chromates | Wool |

- Silica Dusts—
 - Agate
 - Berotonite
 - Chalcedony
 - Cristobalite
 - Diatomaceous Earth
 - Flint
 - Gannister
 - Granite
 - Infusorial Earth
 - Jasper
 - Novaculite
 - Onyx
 - Opal
 - Quartz
 - Sand
 - Tridymite
 - Tripoli
- Silicate Dusts—
 - Ashes
 - Carborundum
 - Clay
 - Feldspar
 - Ferrosilicon
 - Fullers Earth
 - Fireclay
 - Glass
 - Garnet
 - Mica
 - Portland Cement
 - Pumice
 - Slate
 - Soapstone
 - Talc
- Dyes—
 - Coal Tar
 - Shoe Dyes
 - Stains
- Extreme Temperature Changes
- Fluorides—
 - Calcium Fluoride
 - Fluorine Gas
 - Hydrofluoric Acid
- Gases (N. O. S.)—
 - Acetylene
 - Ammonia
 - Carbon Dioxide
 - Oxides of Nitrogen
 - Ozone
 - Phosgene
- Halogenated Hydrocarbons—
 - Carbon Tetrachloride
 - Trichlorethylene
 - Perchlorethylene
 - Dichlorethylene
 - Pentachlorethylene
 - Tetrachlorethane
 - Ethyl Chlorbromide
 - Acetylene Tetrabromide
- High Humidity
- Hydrogen Sulphide
- Infections—
 - Actinomycosis
 - Anthrax
 - Blastomycosis
 - Glanders
 - Sporotricosis
 - Tetanus
 - Tularemia
- Inks—
 - Printers
 - Stencil
- Lacquers and Varnishes—
 - Duco
 - Shellac
- Lead—
 - Babbit Metal
 - Lead
 - Litharge
 - Type Metal
 - White Lead
- Manganese
- Medicinals (N. O. S.)—
 - Cocaine
 - Codeine
 - Iodine
 - Morphine
 - Opium
- Pharmaceuticals in general
- Mercury and its Compounds
- Metals (N. O. S.)—
 - Brass
 - Bronzing Powder
 - Cobalt
 - Copper
 - Iron Dust
 - Iron Pyrites
 - Nickel and its Salts
 - Steel
 - Titanium Oxide
 - Zinc, Oxide and Stearate
- Mineral Acids—
 - Hydrochloric
 - Nitric
 - Phosphoric
 - Sulphuric
- Oils, Fats and Waxes (Not Petroleum)—
 - Lard
 - Tallow
 - Vegetable Oils
- Organic Acids—
 - Acetic
 - Formic
 - Oxalic
 - Picric
 - Tannic
- Organic Solvents—
 - Acetone
 - Benzene
 - Carbon Disulphide
 - Diethyl Sulphate
 - Ethylene Glycol
 - Kerosene
 - Naphtha
 - Prestone
 - Toluene
 - Turpentine
 - Xylene
- Paints and Enamels—
 - Japan Compounds
 - Lithopone
 - Zinc Paint
- Petroleum Products (Other than Solvents)—
 - Asphalt
 - Greases
 - Lubricants
 - Mineral Oil
 - Paraffin
 - Tar and Pitch
- Phosphorus
- Salts Inorganic (N. O. S.)
- Selenium and its Compounds
- Sulphur and its Compounds—
 - Barium Sulphide
 - Calcium Sulphide
 - Potassium Sulphide
 - Tuads
 - Zinc
- Sulphur Dioxide

TABLE 60—ALPHABETICAL LIST OF MATERIAL CLASSIFICATIONS

| <i>Material</i> | <i>Classification</i> |
|---|---|
| Abrasives..... | Non-Siliceous Dusts |
| Accelerators..... | Accelerators |
| Acetanilide..... | Aniline and its Compounds |
| Acetic Acid..... | Acids, Organic |
| Acetone..... | Organic Solvents |
| Acetylene..... | Other Gases |
| Acetylene Tetrabromide..... | Halogenated Hydrocarbons |
| Acrolin..... | Aldehydes |
| Alabastine..... | Non-Siliceous Dusts |
| Alcohols..... | Alcohols, Esters and Ethers |
| Alundum..... | Non-Siliceous Dusts |
| Alum..... | Inorganic Salt |
| Aluminum Oxide..... | Other Metals and their Compounds |
| Amines (Alifatic)..... | Amines |
| Ammonia..... | Other Gases |
| Ammonia Formaldehyde..... | Accelerators |
| Ammonium Chloride..... | Inorganic Salts |
| Ammonium Hydroxide..... | Alkaline Compounds |
| Amyl Acetate..... | Alcohols, Esters and Ethers |
| Aniline..... | Aniline and its Compounds |
| Aniline Dyes..... | Dyes |
| Antimony..... | Antimony |
| Antimony Sulphide..... | Sulphur and Compounds |
| Anthrax..... | Infections |
| Arsenic..... | Arsenic and its Compounds |
| Arsine..... | Other Gases |
| Ashes..... | Silicate Dusts |
| Asbestos..... | Asbestos Dust |
| Asphalt..... | Petroleum Products |
| Babbitt..... | Lead and its Compounds |
| Bakelite..... | Coal-tar Products |
| Barium Sulphide..... | Sulphur and Alkaline Sulphides |
| Barium Sulfate..... | Non-Siliceous Dusts |
| Benzene..... | Benzene |
| Benzine..... | Organic Solvents |
| Benzol (Benzene)..... | Benzene |
| Beritonite..... | Silica Dusts |
| Brass..... | Other Metals and their Compounds |
| Bone Meal..... | Non-Siliceous Dusts |
| Brine..... | Inorganic Salts |
| Bronzing Powder..... | Other Metals and their Compounds |
| Butyl Acetate..... | Alcohols, Esters and Ethers |
| Butyl Aldehyde..... | Accelerators |
| Cadmium..... | Cadmium and its Compounds |
| Calcium Chloride..... | Inorganic Salts |
| Calcium Cyanamide..... | Amines |
| Calcium Hydroxide..... | Alkaline Compounds |
| Calcium Oxide..... | Alkaline Compounds |
| Calcium Sulphide..... | Sulphur and Alkaline Sulphides |
| Calcium Tri Phosphate..... | Non-Siliceous Dusts |
| Carbon Dioxide..... | Other Gases |
| Carbon Bisulphide..... | Organic Solvents |
| Carbon Monoxide..... | Carbon Monoxide |
| Carbon Tetrachloride..... | Halogenated Hydrocarbons |
| Carborundum..... | Silicate Dusts and Carborundum |
| Carbon Black..... | Organic Dusts |
| Caustic Soda..... | Alkaline Compounds |
| Cement..... | Silicate Dusts and Carborundum |
| Celluloid Solution..... | Lacquer |
| Chemicals, Inorganic (Not otherwise specified)..... | Chemicals |
| Celluloid Dust..... | Organic Dusts |
| Chemicals, Organic (Not otherwise specified)..... | Organic Dusts |
| Chalk—French..... | Silicate Dust |
| Chlorine..... | Chlorine |
| Chloroform..... | Halogenated Hydrocarbons |
| Chocolate..... | Dermatitis Producers |
| Chromates..... | Chromium and its Compounds |
| Chromic Acid..... | Chromium and its Compounds |
| Chrome Alum..... | Chromium and its Compounds |
| Chrome Ore..... | Chromium and its Compounds |
| Cleaning Liquids and Compounds..... | Either Organic Solvents or Alkaline Compounds (specify) |
| Clay..... | Silicate Dusts |
| Coal Dust, Anthracite..... | Coal Dust, Anthracite |
| Coal Dust, Bituminous..... | Coal Dust, Bituminous |
| Cobalt and its Compounds..... | Other Metals and their Compounds |
| Cocaine..... | Medicinals |
| Codeine..... | Medicinals |
| Coke..... | Silicate Dusts |
| Copper and its Compounds..... | Other Metals and their Compounds |
| Copper Oxide..... | Other Metals and their Compounds |
| Corundum..... | Non-Siliceous Dusts |
| Cotton..... | Organic Dust |
| Creosote..... | Coal-tar Products |
| Cumar Resin..... | Coal-tar Products |
| Cutting Compounds..... | Dermatitis Producers |
| Cyanides..... | Cyanides |
| Cyanogen..... | Cyanides |
| Dichlorethylene..... | Halogenated Hydrocarbons |
| Diethyl Sulphate..... | Alcohols, Esters and Ethers |
| Dimethyl Aniline..... | Aniline and its Compounds |
| Dough..... | Dermatitis Producers |
| Dextrin..... | Organic Dusts |
| Dragons Blood..... | Organic Dusts |
| Duco..... | Lacquer and Varnishes |

| <i>Material</i> | <i>Classification</i> |
|---|----------------------------------|
| Dyes..... | Dyes |
| Emery Dust..... | Non-Siliceous Dusts |
| Ethyl Acetate..... | Alcohols, Esters and Ethers |
| Ethyl Alcohol..... | Alcohols, Esters and Ethers |
| Ethylene Dichloride..... | Halogenated Hydrocarbons |
| Enamel..... | Paints and Enamels |
| Esters..... | Alcohols, Esters and Ethers |
| Ether..... | Alcohols, Esters and Ethers |
| Feathers..... | Organic Dusts |
| Felt Dust..... | Organic Dusts |
| Ferrosilicon..... | Silicate Dusts |
| Fibre..... | Organic Dusts |
| Fibre Boards..... | Organic Dusts |
| Fire Clay..... | Silicate Dusts |
| Flint..... | Silica Dust |
| Feldspar..... | Silicate Dusts |
| Flour..... | Organic Dusts |
| Formaldehyde..... | Aldehyde |
| Formic Acid..... | Acids, Organic |
| Fuller's Earth..... | Silicate Dusts |
| Fur Dust..... | Organic Dusts |
| Gasoline..... | Organic Solvents |
| Garnet..... | Silicate Dusts |
| Gannister..... | Silica Dust |
| Glue..... | Dermatitis Producers |
| Glass..... | Silicate Dusts |
| Water Glass Cement—Sodium Silicate..... | Silicate Dusts |
| Graphite..... | Organic Dust |
| Granite..... | Silica Dusts |
| Grain Alcohol..... | Alcohols, Esters and Ethers |
| Grease..... | Petroleum Products |
| Gums..... | Organic Dusts |
| Gypsum..... | Non-Siliceous Dusts |
| Hexamethylenetetramine..... | Accelerators |
| Hexine..... | Accelerators |
| Hides..... | Infections |
| Hydrochloric Acids..... | Acids, Mineral |
| Hydrocyanic Acids..... | Cyanides |
| Hydrofluoric Acid..... | Fluorides |
| Hydrogen Sulphide..... | Hydrogen Sulphide |
| Hydroquinone..... | Coal-tar Products |
| Inks..... | Inks |
| Iodine..... | Medicinals |
| Intusorial Earth..... | Silica Dust |
| Iron Dust..... | Other Metals and their Compounds |
| Iron Oxide..... | Other Metals and their Compounds |
| Iron Pyrites..... | Other Metals and their Compounds |
| Japan Compounds..... | Paints and Enamels |
| Jaspar..... | Silica Dusts |
| Kapock..... | Organic Dusts |
| Kerosene..... | Organic Solvents |
| Lacquer..... | Lacquer and Varnishes |
| Lampblack..... | Organic Dusts |
| Lard..... | Oils, Waxes and Fats |
| Lead..... | Lead and its Compounds |
| Lead Salts..... | Lead and its Compounds |
| Litharge..... | Lead and its Compounds |
| Linseed Oil..... | Oils, Waxes and Fats |
| Leather Cement..... | Organic Solvents |
| Leather..... | Organic Dusts |
| Lime, Quick or Slack..... | Alkaline Compounds |
| Limestone..... | Non-Siliceous Dusts |
| Lubricants..... | Petroleum Products |
| Lycopodium..... | Sulphur and Compounds |
| Magnesite..... | Non-Siliceous Dusts |
| Manganese..... | Manganese |
| Marble..... | Non-Siliceous Dusts |
| Meats..... | Dermatitis Producers |
| Mercury..... | Mercury and its Compounds |
| Mercury Nitrate..... | Mercury and its Compounds |
| Methanol..... | Alcohols, Esters and Ethers |
| Metallic Oxides (Mineral)..... | Non-Siliceous Dusts |
| Metallic Oxides (Unless Mineral)..... | Other Metals and their Compounds |
| Metal Fumes..... | Other Metals and their Compounds |
| Methyl Alcohol..... | Organic Solvents |
| Methyl Chloride..... | Halogenated Hydrocarbons |
| Mica..... | Silicate Dusts |
| Mineral Oils..... | Petroleum Products |
| Morphine..... | Medicinals |
| Muriatic Acid..... | Acid, Mineral |
| Mustard..... | Organic Dusts |
| Naphtha..... | Organic Solvents |
| Naphthalene..... | Coal-tar Products |
| Nitrate..... | Inorganic Salts |
| Nitrocellulose..... | Organic Dusts |
| Nitric Acid..... | Acids, Mineral |
| Nitrobenzene..... | Coal-tar Products |
| Nitrous Oxide..... | Other Gases |
| Novaculite..... | Silica Dusts |
| Oakite..... | Alkalines |
| Oils, Vegetable..... | Oils, Waxes and Fats |
| Oils, Cutting..... | Dermatitis Producers |
| Oils, Mineral..... | Petroleum Products |
| Oleum Spirits..... | Acids, Mineral |
| Onyx..... | Silica Dusts |
| Opal..... | Silica Dusts |
| Opium..... | Medicinals |

| <i>Material</i> | <i>Classification</i> |
|--|--|
| Oxalic Acid..... | Acids, Organic |
| Ozone..... | Other Gases |
| Paint, non-lead..... | Paint |
| Paint, Lead..... | Lead and Paint |
| Paper..... | Organic Dusts |
| Paraffin..... | Petroleum Products |
| Perchlorethylene..... | Halogenated Hydrocarbons |
| Petroleum..... | Petroleum Products |
| Pharmaceuticals..... | Medicinals |
| Phenolic Resins..... | Coal-tar Products |
| Phosgene..... | Other Gases |
| Phosphine..... | Phosphorus |
| Phosphoric Acid..... | Acids, Mineral |
| Phosphorus Copper..... | Other Metals and their Compounds |
| Picric Acid..... | Acids, Organic |
| Piperidine..... | Accelerators |
| Pitch..... | Petroleum Products |
| Phenol..... | Coal-tar Products |
| Portland Cement..... | Silicate Dusts |
| Potash..... | Alkaline Compounds |
| Potassium Carbonate..... | Alkaline Compounds |
| Potassium Cyanide..... | Cyanides |
| Potassium Dichromate..... | Chromium and its Compounds |
| Potassium Hydroxide..... | Alkaline Compounds |
| Potassium Sulphide..... | Sulphur and Alkaline Sulphides |
| Prestone..... | Organic Solvents |
| Primer..... | Organic Solvents |
| Printer's Ink..... | Ink |
| Prussian Blue..... | Cyanides |
| Prussic Acid..... | Cyanides |
| Pumice..... | Silicate Dusts |
| Pyroxylin..... | Organic Dusts |
| Quartz..... | Silica Dusts |
| Rags..... | Organic Dusts |
| Rayon..... | Organic Dusts |
| Resins..... | Organic Dusts |
| Rockwool..... | Non-Siliceous Dusts |
| Rosin..... | Organic Dusts |
| Rottenstone..... | Silica Dusts |
| Rouge, Polishers..... | Other Metals and their Compounds |
| Rubber..... | Organic Dusts |
| Rubber Latex..... | Dermatitis Producers |
| Rubber Cement..... | Organic Solvents |
| Sal Soda..... | Alkaline Compounds |
| Sand..... | Silica Dusts |
| Sawdust..... | Organic Dusts |
| Selenium..... | Selenium |
| Shale..... | Silica Dusts |
| Shellac..... | Lacquer and Varnishes |
| Shoe Dye..... | Dyes |
| Sisal (Hemp)..... | Organic Dusts |
| Slate..... | Silicate Dusts |
| Soda Ash..... | Alkaline Compounds |
| Soapstone..... | Silicate Dusts |
| Sodium Bisulphite..... | Inorganic Salts |
| Sodium Borate Hydrated..... | Inorganic Salts |
| Sodium Carbonate..... | Alkaline Compounds |
| Sodium Chloride..... | Inorganic Salts |
| Sodium Cyanide..... | Cyanides |
| Sodium Hydroxide..... | Alkaline Compounds |
| Sodium Hypochlorite..... | Alkaline (if dry) |
| Sodium Meta Phosphate..... | Alkaline |
| Sodium Nitrate..... | Alkaline |
| Sodium Silicate..... | Alkaline |
| Sodium Sulphide..... | Sulphur and Alkaline Supplies |
| Sodium Sulphite..... | Inorganic Salts |
| Sodium Thiosulphite..... | Inorganic Salts |
| Spices..... | Organic Dusts |
| Stains..... | Dyes |
| Stripping Compounds..... | Alkaline Compounds |
| Straw..... | Organic Dusts and Infections |
| Starch..... | Organic Dusts |
| Stearic Acid..... | Acids, Organic |
| Steel..... | Other Metals and their Compounds |
| Stencil Ink..... | Inks |
| Sugar..... | Dermatitis Producers |
| Sulphur..... | Sulphur and Alkaline Supplies |
| Sulphuric Acid..... | Acids, Mineral |
| Sulphur Dioxide..... | Sulphur Dioxide |
| Sulphuretted Hydrogen (Hydrogen Sulphide)..... | Hydrogen Sulphide |
| Sulphur Monochloride..... | Acids, Mineral |
| Talc..... | Silicate Dusts |
| Tallow..... | Oils, Waxes and Fats |
| Tannic Acid..... | Acids, Organic |
| Tar..... | Petroleum Products |
| Tetanus..... | Infections |
| Tetrachlorethane..... | Halogenated Hydrocarbons |
| Titanium Oxide..... | Other Metals and their Compounds |
| Toluol..... | Organic Solvents |
| Tobacco..... | Organic Dusts and Dermatitis Producers |
| Tridymite..... | Silica Dusts |
| Trichlorethylene..... | Halogenated Hydrocarbons |
| Tripoli..... | Silica Dusts |
| Tuads..... | Sulphur and its Compounds |
| Type Metal..... | Lead and its Compounds |
| Turpentine..... | Organic Solvents |
| Vaccines..... | Infections |

| <i>Material</i> | <i>Classification</i> |
|-------------------------|----------------------------------|
| Vanilla Bean..... | Dermatitis Producers |
| Varnish..... | Lacquer and Varnishes |
| Vegetable Products..... | Dermatitis Producers |
| Vegetable Oils..... | Oils, Waxes and Fats |
| Vinegar..... | Acids, Organic |
| Washing Powder..... | Alkaline Compounds |
| Waxes..... | Oils, Waxes and Fats |
| White Lead..... | Lead and its Compounds |
| Wood Alcohol..... | Organic Solvents |
| Wood Dust..... | Organic Dusts |
| Wyandotte Cleaner..... | Alkaline Compounds |
| Xylol..... | Organic Solvents |
| Xylene..... | Organic Solvents |
| Zinc..... | Other Metals and their Compounds |
| Zinc Cyanide..... | Cyanides |
| Zinc Hydrosulphite..... | Inorganic Salts |
| Zinc Oxide..... | Other Metals and their Compounds |
| Zinc Nitrate..... | Salt |
| Zinc Stearate..... | Other Metals and their Compounds |
| Zinc Paint..... | Paint |

TABLE 61—INDIANA BUREAU OF INDUSTRIAL HYGIENE CODE OF CONTROL MEASURES

| <i>CODE</i> | <i>MEANING</i> |
|--------------|----------------------------|
| 1. POS..... | <i>POS</i> itive |
| 2. N..... | <i>N</i> egative |
| 3. LE..... | <i>Local Exhaust</i> |
| 4. ENC..... | <i>ENC</i> losure |
| 5. W. M..... | <i>Wet Method</i> |
| 6. G. M..... | <i>Gas Mask</i> |
| 7. RESP..... | <i>RES</i> pirator |
| 8. ALR..... | <i>Air Line Respirator</i> |
| 9. P. C..... | <i>Protective Clothing</i> |
| 10. OTH..... | <i>OTH</i> er |

APPENDIX C

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